

Metals Review

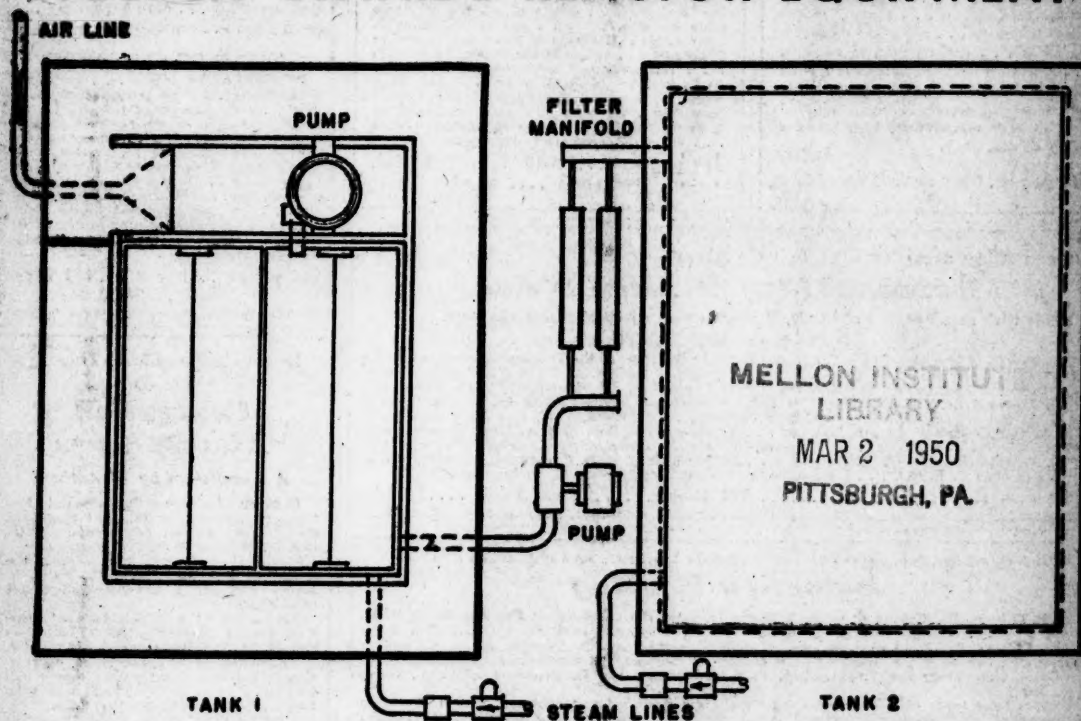
THE NEWS DIGEST MAGAZINE

Published by the American Society for Metals

Volume XXIII • No. 2

February • 1950

HOLDEN CYANIDE REACTOR EQUIPMENT



The above equipment is designed for use with HOLDEN CYANIDE REACTOR. Steam or heat may be used in either of the two tanks where work is to be washed after oil quenching. The cyanide reactor can be added later to eliminate the cyanide in the water.

In reacting ordinary wastes which are mixed with water — either solids from an oil quench tank or waste solutions from a plating tank — the primary reaction in tank No. 1 takes place at 70° to 100° F. Both tanks are equipped with steam heating where steam is available, and the equipment can be utilized at temperatures up to 180° to 200° F.

After the Reactor has reacted with the cyanides in tank No. 1, the solution is pumped to tank No. 2 and the supernatant liquid is tested for ppm. If the ppm are within 2 to 5, the solution may be drained out in conjunction with your normal water supply. If the ppm are higher than 2 to 5 ppm, then heat is applied to the supernatant liquid and the solution is aerated at 160° F.

The reactor tank is equipped with sludge pans for suitable sludge removal, and the sludge may be disposed of by dumping.

THE A. F. HOLDEN COMPANY

New Haven 8, Conn.

1627 W. Fort St., Detroit 16, Mich.

Do You Have These Essential Published Works on Heat Treating?

One of the Original
works on . . .

Nitriding

A Symposium by 11 Authors

Organized by W. B. Coleman, this book contains a great deal of important information by eleven experts and includes the comments of more than a score of engineers.

TABLE OF CONTENTS

The white layer in gun tubes and its relation to the case of nitrided chromium-aluminum steel . . . observations on the iron-nitrogen system . . . a study of the nitriding process . . . researches on nitriding steels . . . investigations in nitriding . . . short-time nitriding of steel in molten cyanides . . . a few practical fundamentals of the nitriding process . . . use of nitrided steel in high temperature, high pressure steam service.

220 pages . 6 x 9 . red cloth . \$3.00

By Dr. Edgar C. Bain
Vice-President, Carnegie-Illinois Steel Co.

The Alloying Elements in Steel

This authoritative book contains six chapters dealing with the functions of alloying elements in steel.

TABLE OF CONTENTS

Alloying elements in unhardened steels are summarized along with the effects of alloying elements in forming austenite . . . alloying elements in steel rendered austenitic for hardening . . . alloy distribution in heated steels . . . summary of elements in steel at austenitic temperature . . . effects of the elements in hardening steel . . . characteristics of the austenite-martensite transformation . . . concepts of hardenability . . . effects of alloying elements upon hardenability . . . unique structures in alloy steels . . . effects of alloying elements in tempering . . . nature of the tempering reaction . . . retardation of softening and secondary hardness . . . similarities in tempered alloy steels . . . loss of toughness in intermediate tempering . . . tempering of structures other than martensite . . . value of tempering data . . . steels rendered inhomogeneous.

312 pages . . . 6 x 9 . . . 186 illus.
red cloth . . . \$5.00

THE FIELD IS WIDE OPEN TO THE
MAN WHO HAS THE FACTS AT HAND.

These seven volumes should
be in every heat treating shop for
ready reference.

No. 1 in Your Library

Principles of Heat Treatment

By Dr. M. A. Grossmann

Director of Research
Carnegie-Illinois Steel Corp.

Here is a useful book for every
heat treating operation—hardening
normalizing . . . tempering . . .
austempering . . . case hardening . . .
grain sizes . . . annealing.

TABLE OF CONTENTS

Principles of hardening . . . variations of hardening . . . the process of normalizing . . . the process of tempering . . . transformation of austenite—the S-curve in austempering . . . heat treatment operation of case hardening . . . grain sizes, their manner of varying and their relation to hardening . . . heat treatment operation of annealing . . . equipment for heat treating . . . the iron-carbon diagrams. Each chapter is preceded by a summary of its contents which makes for a more comprehensive understanding.

244 pages . . 6 x 9 . . 174 illus.
cloth . . \$4.50

Fifteen Alloy Steel Experts Tell Us About—

Hardenability of Alloy Steels

Deals with many phases of hardenability in nine comprehensive chapters.

TABLE OF CONTENTS

The Physics of Hardenability—The Mechanism and the Rate of the Decomposition of Austenite—By Robert F. Mehl . . . Hardenability Tests—By W. E. Jominy . . . The Effect of the Silicon and Aluminum Addition on the Hardenability of Commercial Steels—By M. J. R. Morris and H. W. McQuaid . . . Hardenability, Its Relation to Quenching, and Some Quantitative Data—By M. A. Grossmann, M. Asimow and S. F. Urban . . . Hardenability of Low Chromium Steels—By Walter Crafts and John L. Lamont . . . Transverse Hardness Tests of Heat Treated Steels—By Gordon T. Williams . . . Hardenability and Its Designation, the Hardenability Line—By B. R. Queneau and W. H. Mayo . . . Hardenability of Plain Carbon Steels—By John L. Burns and Glen C. Riegel . . . Hardenability in Light Sections—By G. V. Luerasen.

318 pages . . . 6 x 9 . . . 161 illus. . . . red cloth . . . \$3.50

"A Noteworthy Symposium by Acknowledged Leaders", says MACHINE DESIGN

Induction Heating

H. B. Osborn, Jr., director of research, Tocco Division, Ohio Crankshaft Co., Cleveland; P. H. Brace, consulting metallurgist, Research Laboratories, Westinghouse Electric Corp., East Pittsburgh; William G. Johnson, supervisor of applied mechanics, Engineering Dept., Caterpillar Tractor Co., Peoria, Ill.; J. Wesley Cable, director of research and development, Induction Heating Corp., New York; and T. E. Eagan, chief metallurgist, The Cooper-Bessemer Corp., Grove City, Pa.

Various basic types of induction heating circuits are described and analyzed, with a discussion of resonance, spark-excited generators, motor generators, vacuum tube circuits and resonant cavities. Power factors and power efficiency are compared.

Fundamentals of the important problem of residual stress are considered, stress analysis of cylindrical shapes is analyzed, calculated and measured; stress distribution in induction hardened spots and gear teeth is described. Practical problems such as prevention of cracking in induction hardening areas about oil holes, distortion of hardened parts and fatigue failures near hardened fillets are noted.

Flame hardening and the problem of heat distribution are compared with induction hardening of carburized parts. Dielectric heating of non-metallic materials is briefly discussed and several important applications noted.

172 pages . . . 6 x 9 . . . 113 illus. . . . red cloth . . . \$3.00

The American Society for Metals

7301 Euclid Ave., Cleveland 3, Ohio

Please send me

- ☐ Nitriding . . . \$3.00 ☐ Age Hardening of Metals . . . \$5.00
☐ The Alloying Elements in Steel . . . \$5.00
☐ Principles of Heat Treatment . . . \$4.50 ☐ Induction Heating . . . \$3.00
☐ Hardenability of Alloy Steels . . . \$3.50 ☐ Controlled Atmospheres . . . \$4.00

Name Title

Firm Street Address

City Zone State

Check enclosed ☐ Bill me ☐ Bill my Company ☐

Belongs in Every Heat Treating
Department

Controlled Atmospheres

A Symposium by 16 Authors

Contents include: Fundamental features, particularly for the heat treatment of steel, by H. W. Gillett and B. W. Gonser, Battelle Memorial Institute.

Chemical equilibrium as a guide in the control of furnace atmospheres, by J. B. Austin and M. J. Day, United States Steel Corp.

Prevention of oxidation type of reaction, ferrous metals, by A. G. Hotchkiss and H. M. Webber, General Electric Co.

Prevention of oxidation type of reaction in the heat treatment of copper and its alloys, by E. G. deCorioli and Wm. Lehrer, Surface Combustion Corp.

Heat treatment of the chromium-carbon stainless steels, by W. E. Mahin and W. C. Troy, Westinghouse Electric Corp.

Determining the degree of carburization or decarburization and evaluating controlled atmospheres, by Norbert E. Koebel, Lindberg Engineering Co.

Surface effects accompanying the heating of carbon tool steel in oxidizing atmospheres, by R. D. Stout and Toivo Aho, Lehigh University.

Cost of controlled atmospheres—equipment, instruments and operating, by Edward E. Slowter, Battelle Memorial Institute.

Atmospheric control in the heat treatment of magnesium products, by C. E. Nelson, Dow Chemical Co.

232 pages . . 6 x 9 . . 84 illus.
red cloth . . \$4.00

20 Outstanding Authors
Write on . . .

Age Hardening of Metals

450 pages . . 243 illus. . . 6 x 9
red cloth . . \$5.00

Metals Review

THE NEWS DIGEST MAGAZINE

RAY T. BAYLESS, Publishing Director

MARJORIE R. HYSLOP, Editor

GEORGE H. LOUGHNER, Production Manager

VOLUME XXIII, No. 2

FEBRUARY, 1950

A.S.M. REVIEW OF METAL LITERATURE

New Classification System

Starting with this issue of *Metals Review*, a new classification system is adopted for the *ASM Review of Metal Literature*. It is based on the *ASM-SLA Classification of Metallurgical Literature*, described on page 4. Below are the titles of the main sections of the classification, together with the page numbers in this issue. The scope of each of these sections is indicated in greater detail in the outline on pages 6 and 7.

A — GENERAL METALLURGICAL	18
B — RAW MATERIALS AND ORE PREPARATION	19
C — NONFERROUS EXTRACTION AND REFINING	20
D — FERROUS REDUCTION AND REFINING	21
E — FOUNDRY	21
F — PRIMARY MECHANICAL WORKING	22
G — SECONDARY MECHANICAL WORKING	23
H — POWDER METALLURGY	24
J — HEAT TREATMENT	24
K — JOINING	26
L — CLEANING, COATING AND FINISHING	28
M — METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES	31
N — TRANSFORMATIONS AND RESULTING STRUCTURES	32
P — PHYSICAL PROPERTIES AND TEST METHODS	33
Q — MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION	35
R — CORROSION	38
S — INSPECTION AND CONTROL	39
T — APPLICATIONS OF METALS IN EQUIPMENT AND INDUSTRY	41
V — MATERIALS INDEX	43

IMPORTANT LECTURES

Nodular Cast Iron Is Newest Star on Foundry Horizon—R. G. McElwee	7
Spectroscopic Methods Instigate Revolution in Metallurgical Analysis—J. R. Churchill	7
Porosity and Shrinkage Plague Copper Foundryman—G. P. Halliwell	8
Newer Processes in Powder Metallurgy Expand Application—John Shaw	9
Aluminum Industry Looks to Canada for Power Needs—Paul V. Faragher	9
Cheaper Titanium in Five Years—J. L. Wyatt	10
Furnace Brazing Is Economical Fabrication Method—Norbert K. Koebel	11
Selenium-75 and Cobalt-60 Used in Radiography—Don M. McCutcheon	11
Developments in Modern Steelmaking—W. J. Reagan	12
Mathematics of Diffusion—Frederick Seitz	14
Nondestructive Tests—Leslie W. Ball	15
High-Temperature Strength Is Chief Advantage of Postwar "Superalloys"—J. B. Henry	17
Mountains Moved to Extract Copper, "Everlasting" Metal—R. Carson Dalzell	46
Stress Analysis Aids Design—William T. Bean, Jr.	46

DEPARTMENTS

Thirty Years Ago	7
Compliments	9
New Films	14
Meeting Calendars	16, 17
Employment Service Bureau	45
Quarter-Century Club	46

Published monthly by the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio; Arthur E. Focke, President; Walter E. Jominy, Vice-President; William H. Eisenman, Secretary; Ralph L. Wilson, Treasurer; Thomas G. Digges, Elmer Gammeter, Fred J. Robbins, Harry P. Croft, Trustees; Harold K. Work, Past President. Subscriptions \$5.00 per year (\$6.00 foreign). Single copies \$1.00. Entered as Second Class Matter, July 26, 1930, at the Post Office at Cleveland, Ohio, under the Act of March 3, 1879.

Claims for missing numbers will not be allowed if received more than 60 days from date of issue. No claims allowed from subscribers in Central Europe, Asia, or the Pacific islands other than Hawaii, or because of failure to notify the circulation department of a change of address, or because copy is "missing from files".

(3) FEBRUARY, 1950

New Classification Outline Gives First Complete Breakdown of Metallurgical Field

New Scheme Is Adopted for Coding and Classifying Review of Metal Literature; Punch Card Filing System Developed

With this issue of *Metals Review*, a new classification system is adopted for the A.S.M. Review of Metal Literature. The new system represents the culmination of a year's work undertaken by the ASM-SLA Literature Classification Committee.*

The classification is designed to serve a threefold purpose: (a) to provide a logical and practical breakdown of the entire metallurgical field which can have universal applications in classifying the literature; (b) to serve as a guide for a punch card filing system that can be used by the individual metallurgist or librarian for his own data collections; and (c) to be used as a pattern for classifying and coding the abstracts published in the A.S.M. Review of Metal Literature.

Previous to the committee's work, no thorough analysis of the subject of metallurgy as an entity was available. Existing classification systems, such as the Dewey Decimal, Universal Decimal, and various library cataloging systems, were designed to accommodate all fields of science and technology, with the result that metallurgical interests were scattered somewhat promiscuously among a variety of other subjects. What attempts had been made to treat metallurgy as a separate science were either inadequate or impractical.

It is hoped that the new classification can serve both librarians and metallurgists in a variety of ways. A file of clippings, reports, notes, pamphlets and similar material can be brought into logic and order by following the subject outline. A file of standard card references to metallurgical literature can be similarly classified or indexed.

*Membership of the committee, sponsored jointly by the American Society for Metals and the Special Libraries Association, consists of T. D. Yensen, manager, magnetic department, Westinghouse Electric Corp. (chairman); A. H. Geisler, Knolls Research Laboratory, General Electric Co.; F. T. Sisco, technical director, Engineering Foundation; Taylor Lyman, associate editor of *Metal Progress* and editor of *Metals Handbook*; Henry P. George, metallurgist, Frankford Arsenal; W. W. Howell, technical abstractor, Battelle Memorial Institute; Meredith S. Wright, librarian, National Carbon Co., Inc.; Robert W. Kollar, research librarian, Fenn College (formerly librarian at Republic Steel Corp.); and Marjorie E. Hyslop, editor, *Metals Review* (secretary).

METALS REVIEW (4)

The most important use of the system, however, is in conjunction with the newer methods of punch card filing of literature references, and the committee's exhaustive work in this field has resulted in the design of a standard card which will be made available to individual users in the near future.

The outline of the main sections of the classification appears on the following pages, showing the code symbols that will be used henceforth in the A.S.M. Review of Metal Literature to indicate the principal subjects of a literature reference. The reader is urged to disregard the jumps in the numbering and lettering sequences used for coding the subheadings. These coding symbols are designed for use with the punch card system, and are so arranged as to allow ample room for expansion of the main headings and all of their subdivisions, as future scientific and technological developments may require.

One of the virtues of the coding system lies in the possibility of relieving the busy technical man from the onerous duty of conducting a literature search. After looking over the classification outline, he can jot down the symbols representing the subjects in which he is interested and then ask a clerk or stenographer to scan the monthly issues of *Metals Review* and clip or otherwise bring to his attention all of the references coded with these symbols.

Scope of the Classification

The classification shown on the following pages is a highly condensed outline of the entire project. In the complete classification the various fields have been broken down into finer subdivisions which serve to define still further the scope of the main headings. Ample opportunity is provided, however, for the specialist to expand his own particular field of interest to any desired degree.

In this classification the subject of metallurgy is treated from two different aspects—an index for "processes and properties" and one for "materials". It is so designed that the two methods of classifying can be used in conjunction with each other.

In the A.S.M. Review of Metal Literature, the coding symbols appear at the end of the abstract. When both "processes and properties" and "materials" are indexed, the Processes and Properties Index coding is given first,

followed by the coding referring to the Materials Index.

The Punch Card System

In the punch card system which has been developed, still a third index is provided, known as the "Common Variables Index". The subjects covered in this breakdown are those which are germane to all or a large number of the processes and properties subdivisions. Typical examples of some of the headings in this index are production equipment, tests and testing, metal forms, defects, and temperature. For other uses than a punch card file, such subjects can readily be added as subdivisions under processes, properties or materials.

The punch card method adopted is a hand punch system requiring no expensive machinery. Cards are now being made up and printed by one of the well-known manufacturers of business equipment, and plans are under way for publishing the entire classification in book form. In addition to the complete subject outline, the book will contain a detailed explanation of the punch card system, a series of "work sheets" for inserting additional entries, and an alphabetical word index.

It is estimated that the cards will be available in the early spring and the complete text shortly thereafter. Details and prices will be announced in an early issue of *Metals Review*.

NOTES

(For page 5)

(a) Limited to fuels and refractories in general. Use of fuels and refractories in a specific metallurgical process (melting, heat treating, welding, etc.) constitutes a "Common Variable" (see punch card system, above).

(b) For raw materials used in the foundry, see Section B. For castings (as a metal form), see Common Variables Index.

(c) For forgings and various rolled products and shapes, see "Wrought Metal Forms" in the Common Variables Index.

(d) For "workability", see Q23—Plastic Properties, and Q24—Plastic deformation.

(e) For metal powder forms, see Common Variables Index.

(f) Limited to heat treatment methods and operations. Heat treatment theory is handled in Section N.

(g) For weldments, see Common Variables Index; for welding rods, see T5, for hard surfacing, see L24.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

I. Processes and Properties Index

MAR 2 1950

PITTSBURGH, PA.

A—General Metallurgical

2. History
3. Education
4. Statistics and economics
5. Plant practice
6. Industrial relations
7. Health and safety
8. Secondary metals, scrap and waste disposal
9. Research organizations
10. Glossaries, definitions, trade names, directories

B—Raw Materials and Ore Preparation

10. Ore deposits and raw material reserves
11. Sampling (for assaying, see S11)
12. Mining
13. Crushing, grinding and sizing
14. Concentration and beneficiation
15. Roasting and calcining
16. Sintering and nodulizing
17. Briquetting
18. Fuels technology (a)*
19. Refractories technology (a)*
21. Fluxes and slags
22. Addition agents (ferro-alloys, scrap, oxygen, etc.)

C—Nonferrous Extraction and Refining

21. Smelting (blast furnace, converting, reverberatory, electric furnace)
22. Distillation
23. Electrolytic processes
24. Cyanidation
25. Vacuum refining
26. Reduction by metals (Thermit processes, etc.)
27. Cementation (copper on iron, etc.)
28. Separation of metals
29. Amalgamation
 1. Carbonyl reduction
 2. Hydride decomposition
 4. Halide decomposition
 5. Ingot casting (incl. continuous casting)

D—Ferrous Reduction and Refining

1. Blast furnace process
2. Openhearth process
3. Bessemer process
5. Electric arc process
6. Electric induction process
7. Duplexing, triplexing, multiplexing
8. Other processes (crucible, wrought iron, direct reduction, electrolytic, vacuum melting and casting)
9. Ingot casting (incl. continuous casting)

E—Foundry (b)*

10. Melting techniques (cupola and other methods not covered in Sections C and D)
11. Sand casting
12. Permanent mold casting
13. Die casting
14. Centrifugal casting

15. Precision investment casting
16. Other methods (plaster casting, slush casting)
17. Patterns
18. Sand technology
19. Molding
21. Coremaking
22. Rigging (heading, gating, risers)
23. Pouring
24. Shakeout and trimming (see G18 for grinding, G22 for flame cutting; Section L for other finishing operations)
25. Metallurgical control (solidification phenomena, fluidity, structure control; for heat treatment, see Section J)

F—Primary Mechanical Working (c)*

21. Preparation for working (stripping, heating, scalping, chipping, torch scarfing; for pickling see L12; for blasting, see L10)
22. Forging (incl. drop forging)
23. Rolling
24. Extrusion
25. Swaging
26. Tubemaking (seamless and pressure welded)
27. Drawing of rod
28. Wire drawing
29. Finishing operations (slitting, sawing, shearing, straightening, flattening and leveling; for cleaning and polishing see Section L; for heat treatment see Section J)
1. Lubricants

G—Secondary Mechanical Working (d)*

1. Press work in general
2. Blanking and punching
3. Stamping (coining and embossing)
4. Drawing (shallow, deep, cupping)
5. Impact extrusion
6. Bending
8. Rubber pad forming
9. Stretch forming
10. Heading
11. Roll forming
12. Thread rolling
13. Spinning
14. Bulging
15. Shearing and trimming (slitting)
16. Die sinking
17. Machining (incl. machinability)
18. Grinding
19. Honing, lapping and superfinishing
21. Cutting fluids and drawing compounds
22. Flame and arc cutting
23. Prestressing and shot peening

H—Powder Metallurgy (e)*

10. Powder production
11. Powder properties (sieve analysis, particle size and shape, apparent density, flow rate, compressibility)
12. Mixing or blending
13. Lubricants
14. Molding or compacting (cold pressing, hot pressing, rolling)

15. Sintering
16. Post-sintering operations (sizing, re-sintering, re-pressing, impregnating, infiltration)

J—Heat Treatment (f)*

21. Homogenization (see F21b for soaking pit practice, and heating large forgings)
22. Austenitizing
23. Annealing (incl. spheroidizing and malleablizing)
24. Normalizing
25. Patenting
26. Quench hardening (direct, interrupted, low-temperature treatments, hardenability)
27. Precipitation hardening
28. Case hardening (incl. carburizing, nitriding, decarburization)
29. Tempering
 1. Stress-relief
 2. Heating and cooling media (induction heat, flame heat treatment, salt and lead baths, controlled atmospheres, quenching media)

K—Joining (g)*

1. Arc welding (incl. shielded arc, atomic hydrogen, inert-gas, submerged arc, stud welding)
2. Gas welding
3. Resistance welding
4. Thermit welding
5. Forge welding
6. Other welding processes (induction, flow welding)
7. Soldering
8. Brazing
9. Weldability and weld tests
11. Bonding metals to nonmetals
12. Adhesive joining
13. Mechanical fastening (riveting, bolting, lock joints, press fits and shrink fits)

L—Cleaning, Coating and Finishing

10. Mechanical cleaning and polishing (buffing, blasting, tumbling, brushing; for grinding see G18; for honing, lapping, and superfinish, see G19)
12. Chemical cleaning and polishing (pickling, solvent, vapor, alkali, emulsion, salt bath)
13. Electrochemical cleaning and polishing
14. Chemical coatings (oxide, phosphate, chromate)
15. Diffusion coatings
16. Dip coatings (incl. galvanizing)
17. Electroplating
18. Electroforming
19. Anodizing
21. Cathodic oxide coatings
22. Cladding
23. Metal spraying
24. Weld-deposited coatings (hard surfacing)
25. Vapor-deposited coatings
26. Paint and organic coatings (resins, wax, rubber, oil and grease coatings)
27. Ceramic coatings (incl. vitreous enamel)

(Continued on page 6)

(5) FEBRUARY, 1950

*See notes on page 4.

PROCESSES & PROPERTIES INDEX (Cont.)

M—Metallography, Constitution and Primary Structure

21. Microscopy (incl. specimen preparation)
22. Diffraction methods (X-ray, electron, and neutron)
23. Other techniques (microradiography, fractography, tracers, thermal analysis, dilatometry)
24. Phase diagrams
25. Nuclear and atomic structures
26. Crystal structure (for superlattices and long range order, see N10; for transition lattices, see N9)
27. Microstructure (incl. grain size, shape and boundaries; for products of transformations see Section N)
28. Macrostructure (macrography, flow lines, surface markings; for defects, see Common Variables Index)

N—Transformations and Resulting Structures

1. Diffusion
2. Nucleation
3. Grain growth
4. Recovery
5. Recrystallization
6. Allotropic transformations
7. Precipitation
8. Austenite decomposition (and other phenomena of Fe-C system)
9. Other eutectoid reactions (non-ferrous)
10. Superlattice formation (order-disorder and long range order)
11. Other reactions in the solid state
12. Liquid-solid reactions (solid solutions, eutectics, dendritic growth, etc.)
14. Liquid phase reactions
15. Vapor-solid reactions
16. Vapor-liquid reactions

P—Physical Properties and Test Methods

10. Mass
11. Thermal
12. Thermodynamic
13. Chemical
15. Electrical
16. Magnetic
17. Optical

Q—Mechanical Properties and Tests; Deformation

21. Elastic properties (Young's modulus, proportional limit, Poisson's ratio, shear modulus)
22. Anelasticity
23. Plastic properties (strength, ductility, workability, toughness and brittleness)
24. Plastic deformation (slip, twinning, etc.)
25. Stresses (complex, residual, stress analysis)
26. Fracture
27. Tension
28. Compression
29. Hardness
 1. Torsion
 2. Shear
 3. Creep
 4. Stress-rupture
 5. Bend
 6. Impact
 7. Fatigue
 8. Damping
 9. Wear and friction

R—Corrosion

1. Mechanism of corrosion (galvanic, concentration cell, erosion-corrosion, stress-corrosion, corrosion fatigue, fretting corrosion, biological)
2. Corrosive effects (general dissolution, intergranular, pitting, dezincification, cavitation, blistering and exfoliation, graphitic corrosion, scaling, tarnishing, internal oxidation)
3. Atmospheric corrosion
4. Waters
5. Aqueous solutions
6. Concentrated inorganic chemicals
7. Organic chemicals
8. Soils
9. Gases
10. Preventive measures (treatment of environment, inhibitors, passivation, cathodic protection; for coatings and finishes, see Section L)
11. Tests (for field tests, see specific corroding media above, such as atmosphere, soil, water, etc.)

S—Inspection and Control

10. Sorting and identification
11. Composition analysis
12. Statistical control
13. Flaw detection
14. Size measurement (gaging)
15. Surface roughness

16. Temperature measurement and control
18. Process control (rate, humidity, flow)
19. Radiation detection and radioactive tracers
21. Miscellaneous service failures
22. Standards and specifications

T—Applications of Metals in Equipment

21. Automotive
22. Marine
23. Railroads
24. Aircraft
25. Power generation (engines, turbines, boilers, generators)
26. Structures (buildings, bridges, tanks and pressure vessels)
27. Air conditioning
28. Mining and oil field equipment
29. Chemical equipment (oil refining, foods, textiles, pulp and paper, etc.)
1. Electrical and electronic equipment (incl. telephone, telegraph, radio)
2. Armor and ordnance
3. Agricultural equipment
4. Civil engineering equipment (roadbuilding, dams, etc.)
5. Metallurgical equipment (furnaces, rolling mills and rolls, machine tools, dies, welding equipment, incl. welding rods and electrodes)*
6. Small tools (incl. cutlery and hardware)
7. Machine parts (gears, valves, springs, bearings, chain, fasteners)
8. Instruments
9. Fine arts
10. Miscellaneous consumer products (kitchen equipment, furniture, sporting equipment, medical and dental, business machines)

V—Materials

While materials are coded on all abstracts, this section is reserved for literature references dealing with specific materials, and covering various processes and properties in a broad and general way. The materials coding is indicated below.

*Limited to use of metal in the equipment. Use of the equipment in the metal industry is indexed in the appropriate process section.

II. Materials Index

Chemical symbols of the elements are used for coding metals and their alloys. The symbol indicates not only the pure metal, but its alloys as well. In addition, various "materials groups" are coded, as follows:

EG—Element Groups

- a. Common metals
- b. Minor metals
- c. Refractory metals
- d. Platinum metals
- e. Alkali metals
- f. Alkaline earths
- g. Rare earths
- h. Heavy metals
- j. Semi and non-metals
- k. Halogens
- m. Gases

SG—Special Groups

- g. Corrosion resisting
- h. Heat resisting
- j. Tool and forming materials (nonferrous)
- k. Free-machining alloys
- m. Wear resisting alloys
- n. Permanent magnet materials
- p. Soft magnetic materials
- q. Electrical resistance materials

- r. Electrical contacts
- a. Thermal expansion alloys
- a. Thermocouple alloys
- b. Spring alloys
- c. Bearing metals
- d. Low melting point alloys
- e. Type metals
- f. Brazing and soldering alloys

Ferrous Groups (Individually Coded)†

- ST—Steels in general
- CN—Carbon steel
- AY—Alloy steel
- SS—Stainless steel
- TS—Toolsteel
- CI—Cast iron and steel

†The chemical symbol "Fe" is used to indicate pure iron and all other alloys of iron (carbon-free).

Nodular Cast Iron Is Newest Star on Foundry Horizon

Reported by F. D. Widner,

*Metallurgical Division
Surface Combustion Corp.*

That the newest star on the foundry trade horizon holds widespread interest for metals men was well proven by the attendance at the November joint session of the Toledo Chapter A.F.S. and Toledo Group A.S.M. R. G. McElwee, manager of the foundry division of the Vanadium Corp. of America, greatly enhanced the general knowledge of all present with his talk on "Nodular Cast Iron".

Nodular cast iron can be defined as a unique ferrous alloy combining the advantageous features of gray cast iron and malleable iron but devoid of the defects and shortcomings thereof.

A little over a year ago the first public disclosures were made of a process for reproducibly obtaining nodular graphite in the as-cast state in cast irons. Because of the economics involved, British work has been primarily directed toward treatment with cerium, and American work with magnesium. The addition of either element is made to the metal shortly before casting.

General physical properties of the nodular metal are slightly higher than those of malleable iron. The structure should be nearly 100% nodules for best properties. The increased hardness over that of malleable has not proven disadvantageous.

While not generally required except for specific properties, the heat treatments of nodular iron are quite short and simple. Nodular and malleable iron manufacturing costs are also comparable. The cost of alloying elements for making nodular offsets the cost of annealing malleable.

International Nickel Co. has patents on the process, and the speaker mentioned that the first printing of recent patents was exhausted in less than a week. The question session after the talk, led by Technical Chairman Gladwell Davison of the National Supply

Brooklyn Tech Group Elects

Permanent officers have now been installed by the Polytechnic Institute of Brooklyn Group of the New York Chapter A.S.M., recently organized by Brooklyn Polytech students as a subgroup of the main Chapter. William Pollack has been elected chairman, Milton Tamarin vice-chairman, Henry Johnson treasurer, and Robert Carlson secretary.

The group is making plans for bi-monthly meetings and several field trips to metallurgical installations in and around the New York metropolitan area.

Co., also proved the widespread interest in nodular iron.

Before Mr. McElwee's talk a short sound movie enlightened the group on the use of "Chaplets by Tanner". Many shapes of such little gadgets are of prime importance in the proper production of cored castings.

Spectroscopic Methods Instigate Revolution in Metallurgical Analysis

Reported by Sam F. Carter

American Cast Iron Pipe Co.

Application of spectroscopic methods of analysis has resulted in faster determinations, improved metallurgical control, and decreased analytical costs, according to J. R. Churchill in his January talk before the Birmingham Chapter. Mr. Churchill is assistant chief of the analytical division of Aluminum Research Laboratories, Aluminum Co. of America. His subject was "A Revolution in Metallurgical Analysis".

The development of spectroscopic instruments from 1929 to the present time was reviewed. The principal shortcoming of the original spectrograph was the photographic procedure, the speaker said. Development of an electron multiplier photo-tube permitted replacement of the photographic process with a direct-reading photo-electric device.

With the increased speed of the direct-reading spectrometer, a determination of 11 elements can be reported within 4 min. from receipt of the sample. This speed gave rise to the "revolution" from "historical analysis" to "control analysis", resulting in better control and savings in off-analysis heats.

In the Aluminum Co. laboratories, 35 determinations per man-hour are made on the spectrometer compared to approximately two determinations per man-hour by wet analysis methods. Better precision is provided in lower concentrations, and routine determinations that were seldom made before are now possible. Many elements have been found influential in concentrations as low as 0.001%.

The principles of construction and operation of several instruments were described. Accurate standardization is necessary and the structural condition of the sample is very important. Mr. Churchill mentioned research in progress that might develop a spectroscopic method of determining phosphorus and carbon in iron and steel.

Wiedl With Atlantic Steel

Michael F. Wiedl, secretary of the Georgia Chapter A.S.M., has become associated with the Atlantic Steel Co. in the sales department of the manufactured products division. His mailing address is now 2217 Virginia Place, N.E., Atlanta 5, Ga.

THIRTY YEARS AGO

After a short life as independent organizations, the Steel Treating Research Society and the American Steel Treating Society merged in 1920 to form the present American Society for Metals. The early issues of the official publications of these two societies (1917-1920) are filled with nostalgic and historical associations. — Ed.

—30—

SAMUEL L. HOYT's name appears as an author for the first time in May 1919; his subject "notch toughness". Mr. Hoyt, now with Battelle Memorial Institute, was then associate professor of metallography at University of Minnesota and consulting metallurgist for U. S. Bureau of Mines.

—30—

A note in the June issue states that Henry Marion Howe, professor emeritus of metallurgy, Columbia University, had been elected to honorary membership in the society, indicating the "high esteem and regard in which the Doctor is held for his valuable and thorough research in the heat treatment of steel". He was the second honorary member, following the election of Sir Robert Hadfield of England.

—30—

"Modern Views of the Hardening of Steel" were presented before the Pittsburgh Chapter by Haakon Styri. Dr. Styri, since 1920 director of research for S.K.F. Industries of Philadelphia, was then assistant professor of metallurgy at Carnegie Institute of Technology.

—30—

In September 1919 appears an "ANNOUNCEMENT EXTRAORDINARY!!! Campaign for 25,000 Members!! Initiation Fee Waived Until Membership Reaches That Mark!" The membership as of 1950 nears 22,000. There is still no initiation fee. Draw your own conclusions, but let nonmembers be warned to get in under the wire!

—30—

A guest editorial signed by M. T. Clarage is headed "Science Demands Recognition in the Arts" and tells how the secrecy of the older craftsmen is being replaced by the publications of the modern technical man (and of course mentions the part played by the Steel Treating Society in this evolution). Mr. Clarage, then as now, was president of Columbia Tool Steel Co., Chicago.

(7) FEBRUARY, 1950

Clark Discusses High-Temperature Steels



Left to Right at the January Dinner Meeting of the North Texas Chapter Are: Arthur C. Willis, Chapter Secretary; C. L. Clark of Timken Steel and Tube Division, the Speaker; H. B. Lilley, Houston District Sales Manager for Timken Steel and Tube Division; and Elmer O. Davis, Vice-President, Geophysical Service, Inc., Treasurer of the Chapter

Reported by Arthur C. Willis
Instructor
Southern Methodist University

C. L. Clark, metallurgical engineer in charge of special steel developments, Steel & Tube Division, Timken Roller Bearing Co., was speaker of the evening at the January meeting of the North Texas Chapter A.S.M. Dr. Clark's subject was "Steels for High-Temperature Service".

The speaker first discussed the theory and methods for testing steels which are to be used in high-temperature service. The various classes of steels were identified by composition, and the types of service for which each is best suited were described. A balance should be struck between the cost of an alloy and the severity of the conditions under which it must operate, the speaker pointed out.

Precision Cast Parts Cut Machining Costs

Reported by Sayre S. Williams
Mechanical Engineer
U. S. Navy Electronics Laboratory

The main advantage of precision cast parts, according to Walton T. Boyer, president, California Precision Castings, Inc., speaking before the San Diego Chapter A.S.M., lies in the fact that much machining can be eliminated and often several parts can be combined into one piece.

Mr. Boyer prefaced an outline of the modern technique for producing precision investment castings with a statement that the art of precision casting dates back over 2000 years.

The cost of precision cast parts is not low compared to other types of casting, but considering the savings in machining, it becomes an inexpensive method of obtaining the finished product. Almost any metal can be fabricated by this process, and with some metals of low ductility or high hardness, precision casting is the only practical way of producing parts.

METALS REVIEW (8)

Porosity and Shrinkage Plague Cu Foundryman

Reported by Sam F. Carter
American Cast Iron Pipe Co.

Principal problems in casting the copper-base alloys are based on porosity and shrinkage, G. P. Halliwell, director of research, H. Kramer and Co., told the December meeting of the Birmingham Chapter A.S.M. "Non-ferrous Foundry Alloys" was the subject of the evening's program, which included a movie as well as Mr. Halliwell's technical talk.

Porosity, either in the form of pinholes or as interdendritic microporosity, can be most undesirable in casting, although it is somewhat less harmful in rolling operations, the speaker said. Hydrogen is the main cause of porosity. Because higher temperatures increase hydrogen solubility, temperature control is very important.

The aluminum and manganese bronzes, because of their short liquidus range, are characterized by high shrinkage. Alloying elements are added to manganese bronzes for various reasons. Iron refines the grain size, nickel and manganese increase the yield strength, silicon improves fluidity, lead improves machinability, aluminum improves mechanical properties, and tin increases corrosion resistance.

In casting the aluminum bronzes, fast cooling after casting is necessary to obtain good ductility, and turbulence must be minimized to obtain sound castings.

Akron Course Draws 450

Akron Chapter A.S.M. registered between 400 and 450 local technical and shopmen for its winter educational lecture course on "Practical Metallurgy". Classes are held at University of Akron from 8 to 10 p.m. on Wednesday evenings, starting Jan. 25 and ending March 22.

Pulsifer's "Inspection of Metals" will be furnished by the chapter as textbook for the course. Registration fee was \$1.80 (\$2.00 after Jan. 14), refundable to the registrant who attends six of the seven classes. The course is under the direction of L. W. Hudson, 1777 Tenth St., Cuyahoga Falls, Ohio.

President's Night in Cincinnati



Seated at the Dinner Table With Arthur Focke, National A.S.M. President, at the December Meeting of the Cincinnati Chapter Are (From Left): Albert Fischer, Secretary; Walter Klayer, Immediate Past Chairman; Russell Hastings, Vice-Chairman; and Dr. Focke. The president presented the technical talk of the evening, on "Radio-Isotopes in Metallurgy". (Reported by G. Wesley Fischer, metallurgist, Wm. Powell Co.)

Newer Processes in Powder Metallurgy Expand Application

Reported by H. L. Sittler
Metallurgist, Arcrods Corp.

History, advantages, limitations, and some basic developments of current interest in the field of powder metallurgy were reviewed by John Shaw, assistant professor of powder metallurgy at Stevens Institute of Technology, speaking before the Baltimore Chapter A.S.M. on Nov. 21.

Among the production advantages may be listed (a) production of irregular shapes; (b) savings in costly or scarce materials; (c) release of skilled labor and machines; (d) combination of non-alloyable metals in the same part, or combination of metals and nonmetals; (e) production of parts from metals having a melting point too high for casting.

Limitations are along the lines of (a) parts with undercut sections (because of pressing difficulties); (b) limited cross-sectional area (limited mainly by press capacity); (c) limited height of parts (usually 6 in. maximum, although parts up to 20 in. high have been made); and (d) limited availability of materials in sufficient purity.

German industry was not so slow as that of the United States in adapting powder metallurgy to war use. Examples are in the use of tungsten carbide tips on armor piercing projectiles, and rotating bands on shells made of iron powder.

Special research projects are expected to develop new products for postwar use, however. Among basic developments of current interest are alloy powders, which have resulted from the development of a method of making metal powder by disintegration. Hot pressing (pressing and sintering simultaneously) can be used to make steel parts which, when properly heat treated, have mechanical properties equivalent to those of steel bar stock. Hot coining is another newer development, whereby a porous part is heat treated in a reducing atmosphere in a furnace and forged in a closed die; the resulting structure can duplicate that of a heat treated steel.

The fabrication of gas turbine buckets by the powder metallurgy process is now being investigated, the speaker said.

Two short films were presented illustrating such features as the nature of powder metal particles produced by various methods and the nature of a powder metal compact both before and after sintering. The actual production of metal powder parts was also shown, from the mixing of the individual powders through their compaction, sintering, sizing and inspection.



Compliments

TO ALLOY ENGINEERING AND CASTING CORP., Champaign, Ill., and to H. H.

HARRIS, director of a research project currently developing new processes and equipment for the production of alloy castings, on the citation by the National Foundry Association contained in a letter to Secretary of Defense Louis Johnson.

TO DRIVER-HARRIS Co., Harrison, N. J., on the completion of 50 years in business, manufacturing special nickel-chromium alloys.

TO C. A. ADAMS, chairman of the Welding Research Council since its beginning, on his election as honorary chairman; to H. C. BOARDMAN, research director of the Chicago Bridge and Iron Co., and formerly vice-chairman of the Council, on his election as chairman; and to A. B. KINZEL, president of Union Carbide and Carbon Research Laboratories, Inc., on his election as vice-chairman.

TO GEORGE W. CANNON, until recently board chairman of Campbell, Wyant and Cannon, Muskegon, Mich., on the award of the Gold Medal of the Gray Iron Founders' Society, Inc.

TO THE NEW JERSEY CHAPTER A.S.M. on its gift to Stevens Institute of Technology of 22 books published by the American Society for Metals.

TO H. V. CHURCHILL, chief of the analytical chemistry division of Alcoa Research Laboratories, Aluminum Co. of America, on his selection to receive the 1949 Pittsburgh Award by the Pittsburgh Section of the American Chemical Society.

Rockford Secretary Honored

Reported by Wilhelm Olson
Atwood Vacuum Machine Co.

The December meeting of the Rockford Chapter A.S.M. took the form of a Christmas party and ladies' night. A fountain pen was presented to each lady who attended.

National Secretary W. H. Eisenman gave an informal talk. On behalf of the Rockford Chapter, he then presented a sportsman's wristwatch to Herbert Habecker, faithful secretary-treasurer. Mr. Habecker's devoted and efficient service has been an important factor in the success of the chapter, and the membership hopes he will continue in office for a long time. Mrs. Habecker was presented with a bouquet of roses in recognition of her interest in the society.

Movies shown through the courtesy of Allegheny-Ludlum Steel Corp. concluded the program of the evening.

Aluminum Industry Looks to Canada For Power Needs

Reported by C. G. Atchinson
*Assistant Chief Metallurgist
Sheffield Steel Corp.*

Production developments, applications and properties of aluminum were ably discussed by Paul V. Faragher of Aluminum Co. of America at the November meeting of the Kansas City Chapter A.S.M.

The lack of new sources of cheap electric power, the speaker stated, has forced the industry to look toward Canada for further expansion. To produce each pound of aluminum, 10 kw. of power is required, and at present all sources of cheap power in this country are being utilized.

Supplies of rich bauxite are available in Surinam and Arkansas, and even the lower grade ores that run as high as 14% silica can be utilized in the combination purification process that was first used commercially during the recent emergency. Cryolite is readily available from Greenland and is also made synthetically from domestic materials.

The great expansion of our Air Force during the last war was made possible by a comparable increase in aluminum production. During a three-month period late in the war, production reached a rate of one billion pounds per year.

Continuous casting is general throughout the industry and ingots as large as 8,000 lb. have been produced by this method. Structural and plate mills are similar to those used in the steel industry, and are produced by the same companies.

Metallurgical and marketing researches have been combined to maintain a rate of production for peacetime applications approximately four times that of before the war. Tensile strength has been increased from 8000 psi. for pure aluminum to 78,000 psi. by alloying and special treatments, and as a consequence aluminum has become an important structural material.

Many railway passenger cars and most buses are now made of aluminum. The automotive industry has utilized its high heat conductivity, and now a large percentage of all pistons are made of aluminum. Its high electrical conductivity and light weight permit longer spans and fewer towers on transmission lines. It is also being introduced for home wiring. High corrosion resistance makes it ideal for architectural trim.

Dr. Faragher, in closing, made it clear that he does not believe aluminum threatens any other metal. Rather, the properties of each metal, plus economic considerations, provide plenty of applications for all of them.

Canton Entertains National Officers



Canton-Massillon Chapter A.S.M. Had "President's Night" on Jan. 10. Left to right are National Secretary W. H. Eisenman, Chapter Chairman Don Feezel, President Arthur E. Focke, and National Treasurer Ralph L. Wilson, director of metallurgy, Timken Roller Bearing Co., and a member of the local chapter. Also present was Ray T. Bayless, assistant secretary of the society. Dr. Focke spoke on "The Metallurgist, the A.S.M., and the Metals Industry". (Reported by D. J. Girardi)

Shows How Metallurgy Is Related to Design; Three Factors Named

Reported by F. R. Morral
Assoc. Prof. of Materials Engineering
Syracuse University

Three factors enter into the "Relationship of Metallurgy and Design"—the topic presented by Oscar J. Horger to the Syracuse Chapter A.S.M. on Jan. 3. Dr. Horger is chief engineer of the railway division, Timken Roller Bearing Co. The three factors are good design, proper processing (heat treatment, straightening, machining, etc.), and suitable materials. Most difficulties in service can be traced to the first two. Cooperation among the men responsible for these three phases soon shows up in results.

The usual mechanical and metallurgical tests tell only about the uniformity of the material. Other tests are necessary, and in fatigue, no clear-cut correlation has been found between small specimens and large ones tested in large machines or in actual service.

The effect of residual stresses set up in processing may be very important in fatigue, and such stresses can be utilized to increase fatigue life of the part. Residual stresses of the proper direction and the right amount may be applied by cold working, such as cold rolling certain portions of a crankshaft after straightening, or using rolled threads in bolts and oil well drill pipe joints. Some unconventional heat treating proce-

dures may also be used to set up favorable residual stresses that will improve the fatigue properties of axles.

Harold T. Gray gave a coffee talk on the "Lost Wax Process", tracing its history from the days of Cellini, outlining its present status, and discussing the economics and versatility of precision castings.

Appointed Sales Manager For Niles-Bement-Pond

Alexander H. d'Arcambal, past national president of the American Society for Metals, has been appointed general sales manager of the Niles-Bement-Pond Co., West Hartford, Conn. He is an authority on the subject of tool-steels and tools.



A. H. d'Arcambal

Div. of Niles-Bement-Pond since 1919. He was formerly chief metallurgist, and more recently sales manager of the small tool division and consulting metallurgist for the company. He is a graduate of University of Michigan (1912), and held various posts as chemist and metallurgist in the brass, automobile and aircraft industries before coming to Pratt & Whitney. He is a past chairman of the Hartford Chapter A.S.M.

Cheaper Titanium In Five Years Speaker Predicts

Reported by Alexander Lesnewich
Rensselaer Polytechnic Institute

Although very costly at present, titanium, the light, strong, and corrosion resistant "wonder metal", may be structurally plentiful and economical within five years. J. L. Wyatt, development engineer of the National Lead Co., presented this information in his talk on "Titanium, the Wonder Metal" at the Nov. 8th meeting of the Eastern New York Chapter A.S.M.

Titanium ores are plentiful in the United States and Canada but the metal's high melting temperature and great affinity for oxygen make its winning extremely difficult. Mr. Wyatt discussed the Bureau of Mines process for the production of titanium by the reduction of titanium tetrachloride with molten magnesium. National Lead has been using this method, with variations, in its laboratories, but the removal of byproducts and eccentricities of the reduction process so complicate the winning that tonnage quantities of the metal have yet to be produced.

The speaker then reviewed the processes that would be necessary for efficient production of an inexpensive metal. His first suggestion was to recover the low-sulphur, low-silicon, low-carbon pig iron which is a by-product of the smelting of titanium-bearing ilmenite ores. Crushed and ground slag containing 70% titanium would then be chlorinated to produce liquid titanium tetrachloride. After the purification of this liquid by distillation, it would be fed to a reactor where pure magnesium would reduce the compound to titanium. Distillation would remove excess magnesium and byproducts of the reaction, leaving a titanium sponge.

Economics require the electrolysis of the magnesium chloride byproduct to form pure magnesium and chlorine for recycling. Mr. Wyatt believes that this sponge, 99.9% titanium, could sell for 40 to 60¢ per lb. with a production rate of 10 tons per day. The complexity of further purification and melting of the sponge for casting would raise the cost to \$1.50 per lb. for the ingot.

Some of the outstanding properties of titanium include its high strength-weight ratio, complete resistance to sea-water corrosion, and resistance to sulphuric, nitric and dilute hydrochloric acids. Titanium alloys have been developed with tensile strengths of 250,000 psi. with low ductility, and 150,000 psi. with high ductility. Commercial applications were mentioned for the high melting alloys with 4% aluminum, which are more resistant to electricity than the Nichromes.

Furnace Brazing Is Economical Fabrication Method

Reported by W. J. Fretague

Research Assistant
University of Notre Dame

The wartime impetus given to furnace brazing has been carried over into postwar parts fabrication, and in many instances has actually reduced production costs, Norbert K. Koebel, director of research, Lindberg Engineering Co., said in an address in Notre Dame, Ind., on Nov. 9. Mr. Koebel spoke before a joint meeting of the Notre Dame Chapter A.S.M. and the Michiana Chapter, American Welding Society.

John Grodrian of the Bendix Products Div., Bendix Aviation Corp., who is both a past chairman of the Notre Dame Chapter A.S.M. and also fifth district vice-president of A.W.S., acted as technical chairman for the session.

Mr. Koebel classified brazing methods as (a) furnace brazing, (b) induction and (c) torch. In furnace brazing, a number of joints can be made at the same time, the shape of the objects to be brazed is not limited, and the protective atmosphere in the furnace makes subsequent cleaning operations unnecessary. A disadvantage, however, is that it is necessary to heat the entire assembly. In induction brazing it is not necessary to heat the entire assembly but, on the other hand, multiple joints are not feasible, the assembly must have a regular shape, and the over-all efficiency is poor. Torch brazing is limited, in general, to maintenance applications.

Copper is the most popular brazing material for high-strength applications, but must be used at high temperatures in a reducing atmosphere. Brass, bronze and the various silver solders are among the more popular low-melting brazing materials. A recent development is "phos-iron" for corrosive duty. This material is used in the form of a powder which is pressed into the joint prior to brazing. Aluminum brazing requires close control of time and temperature and a corrosive flux must be employed.

Mr. Koebel explained how the capillary action of the molten brazing material fills the joints of the assembly and alloys slightly with the base metal. In copper brazing, the reducing atmosphere employed breaks down the oxide at the joint with consequent better wetting of the molten copper.

An important consideration is the design of the parts to be brazed. The type of fit used for a joint depends on the flowability of the brazing material and the strength desired from the joint. Brazing materials may be applied to the assembly in

the form of wire, ribbon, or paste; applicators or calking guns may be used to position the brazing materials.

Mr. Koebel described the various types of furnaces used for brazing and analyzed each from the standpoint of initial cost, capacity, and performance. Various methods can be used to produce the desired furnace atmosphere.

A number of interesting slides showing typical brazed assemblies illustrated Mr. Koebel's presentation and actual fabricated parts were on display.

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1951 *Transactions*. A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 32nd National Metal Congress and Exposition to be held in Chicago, Oct. 23 to 27, 1950. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 15, 1950.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

27 Technical Societies Meet Jointly in Buffalo

Reported by G. F. Kappelt

Metallurgist
Bell Aircraft Corp.

The first consolidated program of the Technical Societies Council of the Niagara Frontier was participated in by the Buffalo Chapter A.S.M. on Nov. 16. All 27 technical societies which make up the council suspended their individual meetings and offered a united program on television. This program was presented by M. E. Strieby, staff executive, long lines department, American Telephone and Telegraph Co.

The difficult technical problems in-

volved in providing intercity networks for carrying television around the country provided the main theme of Mr. Strieby's talk. While many of these problems have been solved, as evidenced by networks in daily service, much more development is required for the extension of these facilities across the country.

Two methods for television transmission are by coaxial cable and microwave relay. The radio system, although lower in first cost, can carry fewer channels and is subject to fading under certain conditions. The relative economy and reliability obtainable will ultimately determine which system is best for television.

Selenium-75 and Cobalt-60 Used In Radiography

Reported by John V. Norris

Assistant Metallurgist
Diesel Equipment Division, G.M.C.

The Atomic Energy Commission has made available to industry a wide selection of radioactive isotopes, Don M. McCutcheon, supervisor of applied physics research division of the Ford Motor Co., said before the West Michigan Chapter A.S.M. on Nov. 21. Mr. McCutcheon spoke on "Industrial Applications of Radio-Isotopes" before a joint meeting with the American Foundrymen's Society.

Although these isotopes cannot be used directly as raw material in any product sold to the public, he explained, the improvement of any product will be entirely as a result of the indirect application of isotopes to the materials and processes of manufacturing.

Mr. McCutcheon concentrated his talk on two gamma-ray emitters—cobalt-60 and selenium-75. Their relative cost compared to radium makes them attractive in radiographic work. Selenium-75 is roughly equivalent to a 250-kw. X-ray machine and has a rather short half-life of 120 days, while cobalt-60 is equivalent to a 2-million-volt X-ray machine and has a half-life of 5.3 years.

Radioactive isotopes offer many interesting possibilities in the automotive field. An example is the testing of wear of piston rings while operating in an engine. This is done by first checking the radiation of rings subjected to atomic pile radiation, and then checking the radiation of the oil used in the crankcase, which contains minute particles of the piston ring.

Of special interest to both A.S.M. and A.F.S. members was the method of collimating the radiation from cobalt-60 and mounting a Geiger counter detector on the opposite side of a cupola to detect the height of liquid metal at all times.

Speakers' Table at Pittsburgh



Left to Right at the November Meeting of the Pittsburgh Chapter A.S.M. Are: L. C. Hicks of Allegheny Ludlum Steel Corp., Technical Chairman; E. A. Gee of E. I. duPont Corp., Who Spoke on Titanium; and George A. Roberts of Vanadium-Alloys Steel Corp., Chapter Chairman

Reported by R. M. Allen
Carnegie-Illinois Steel Corp.

Firsthand information on the development, production, properties and projected uses of titanium, together with some of its limitations, provided for Pittsburgh Chapter members a true evaluation of the present and future position of titanium as a commercial metal. The speaker who presented this information before the Nov. 10th meeting was E. A. Gee of the E. I. du Pont de Nemours & Co.

Titanium metal was introduced to this country approximately ten years ago, Dr. Gee said. Its development was sponsored originally by the Bureau of Mines, who made samples of the metal available to various industrial and research organizations.

Several processes are now utilized by du Pont and others to produce pure or nominally pure metal. Du Pont research has led to the production of the metal from titanium tetrahalides by reduction with magnesium. The resulting spongy mass is melted by induction in a vacuum or under argon atmosphere to produce an ingot. The ingot is forged or hot rolled into bars, sheet or strip. These operations can be performed with conventional steel mill equipment.

Titanium has three properties which make it a potentially useful metal—its comparatively light weight, corrosion resistance and high strength. The strength-per-weight ratio of titanium alloy is higher than that of stainless steel, aluminum or magnesium alloys. Tests on the effect of carbon and nitrogen on the strength properties of titanium indicate its usefulness for constructional purposes in air frames and vessels

for chemical equipment. In both of these applications, as well as in aircraft power plant construction, the corrosion and heat resistant properties of the metal would be utilized.

The resistance to sea water corrosion is as good as platinum or Hastelloy C, and for general corrosion resistance it compares favorably with Type 316 stainless. Titanium sheet was practically unaffected by a 2200° F. 30-min. flame test, which would indicate the usefulness of the metal as a firewall material for aircraft.

The metal is weldable by heliarc, spot and resistance methods, and has a machinability comparable to 18-8 stainless.

Metallurgists Must Be Philosophers, Thum Says

Reported by Ben Dixon

Assistant Sales Manager
Dominion Wheel & Foundries Limited
"Metallurgy as a Philosopher Might Look at It" was the intriguing title of the address presented by E. E. Thum, editor of *Metal Progress*, before the Dec. 2nd meeting of the Ontario Chapter A.S.M.

Mr. Thum described the philosopher as a doubter and experimenter—certainly an apt description of a metallurgist as well. It would be a mistake for a metallurgist to be anything else but a philosopher, he pointed out, since the minimums and maximums of today will undoubtedly be exceeded in a few years, especially if research metallurgists and others in the metals industries keep an open and inquiring philosophical viewpoint.

Penn State Professor Outlines Developments In Modern Steelmaking

Reported by D. J. Girardi

Metallurgical Department
Timken Steel and Tube Division

"Modern Developments in Steelmaking" were discussed at the November meeting of the Canton-Massillon Chapter A.S.M. by W. J. Reagan, associate professor of metallurgy, Pennsylvania State College.

The raw material problems facing the steel industry were reviewed, with Canada or South America indicated as possible future sources of iron ore. At the present time about 22% of our total ore production is beneficiated in some manner. Ore blending operations were also described, the main purpose being to produce a more uniform burden for the blast furnace operator.

High-pressure operation of the blast furnace is of value, and carbon refractory linings are being used in some furnaces, the speaker said. Studies now in progress on blast furnace slags will eventually provide the blast furnace man with complete phase diagrams of the usual slags. A new fuel for the blast furnace comes in the form of a coke briquette. Use of oxygen in the blast furnace is still in the experimental stage, but work now in progress should clarify this operation.

When oxygen is used in the openhearth or electric furnace, it may create a problem of excess fumes, a decrease in roof life, and a decrease in waste heat boiler life. By greater dissipation in the steel bath it is possible to reduce the fume and splashing, and probably increase the efficiency of oxygen use. No direct effect of oxygen upon steel quality has been noted. However, when an openhearth or electric furnace bath is low in temperature, oxygen can be used to increase the bath temperature, and thus produce a heat at normal temperature, which means an improvement in quality.

To illustrate the deoxidation phase of steelmaking, Professor Reagan showed slides of different types of inclusions in natural colors. Other slides showed a detailed study of the segregation of nonmetallic inclusions in commercial ingots weighing about 8000 lb.

Temperature control in steelmaking has advanced markedly with the use of the immersion-type pyrometer, and the "blowing tube" type of instrument. Temperature control has been very important in improving steel quality.

Interesting experimental work on the rolling and forging of metals was also shown in a series of slides. The flow of metal under different conditions was compared by means of slides showing cross-sections of forged and rolled material that was initially built up of laminated sections.

Hardenability Is Jominy's Subject



W. E. Jominy (Center), Staff Engineer, Chrysler Corp., Was the Principal Speaker at National Officers' Night of the Calumet Chapter. At left is E. W. Taylor, president of S. G. Taylor Chain Co., chapter chairman; and at right is A. T. Clarage, president, Columbia Tool Steel Co., who gave his observations in 1949 Europe as the subject of a coffee talk

Reported by D. B. Graves

Federated Metals Division
American Smelting and Refining Co.

"How deep should a part be hardened?" was a question asked and answered by Walter E. Jominy, staff engineer, Chrysler Corp., and A.S.M. national vice-president, addressing the annual "Officers' Night" of the Calumet Chapter on Dec. 12. Mr. Jominy spoke on hardenability, and presented some unusual relationships between hardness, fatigue resistance and surface finish.

According to Mr. Jominy, a part which is stressed in torsion or bending should be hardened at least one-fourth the distance from the surface to the center. This is the usual practice, he pointed out, and service results have been good. Hardening all the way through creates more distortion and presents additional problems in straightening the work, he explained.

The endurance limit of a steel

having 90% martensite and above is good, but below 90% the fatigue strength is decreased considerably.

The endurance is greatly affected by the surface finish. The endurance limit of a steel test specimen with a polished surface usually is about 50% of the tensile strength. Mr. Jominy described experiments in which the fatigue strength of a specimen having a ground surface was about 45%, a machined surface about 37% and a forged surface about 18% of the tensile strength,

Grinding Injuries and Techniques Described

Reported by D. A. Thompson

Engineering Test Laboratory
University of Manitoba

Grinding wheels and techniques of grinding were explained by C. W. Fell, sales manager of the Norton Co. of Canada, Ltd., at the Manitoba Chapter meeting on Jan. 12.

By means of slides Mr. Fell illustrated injuries to ground surfaces, and distinguished between injuries caused by improper grinding and those caused by improper heat treatment. He explained the various causes of cracks and burn, and described tests for determining such conditions.

There may be various reasons for surface injury. Dull or loaded wheels are contributing factors to excessive surface heat. Machine variables such as wheel speed, work speed, and condition of the grinding machine are of major importance, while the personal skill of the operator must also be considered.

Mr. Fell's talk was followed by a lively question and answer session covering types of grinding wheels, effect of different wheels on the spark test, and effect of coolants on grinding.

As a coffee talk, Past Chairman Harold J. Farrow outlined the history and activities of the Manitoba Chapter since its inauguration in 1943. He then introduced all of the past chairmen to the group.

Dayton Honors 20-Year Members

Reported by R. L. Moncrief

Frigidaire Div., G.M.C.

Twenty-year members shared the spotlight with National President Arthur E. Focke at the December meeting of the Dayton Chapter A.S.M. Sixteen members of 20 or more years standing were guests of the chapter at a dinner which was highlighted by coffee talks by Fred Reiter, former secretary, and Dr. Focke. Mr. Reiter entertained the group with stories of the chapter's early days, while Dr. Focke discussed the activities of the Society. All but three of the following 20-year members were present:

Earl C. Adkins, Fred J. Blaney, DeWitt Gerstle, Chester L. Gillum, J. D. Hagans, R. H. Heyer, L. S. Jacobson, J. B. Johnson, Richard R. Kennedy, R. P. Koehring, George R. Long, Charles E. Mentel, Jr., B. C. Morris, Ture T. Oberg, George J. Oswald, James A. Parsons, S. R. Prance, Harold A. Towner, and H. H. Walther.

The technical part of the program



20-Year Member Richard R. Kennedy (Left) and National President Arthur Focke Exchange A.S.M. Reminiscences at Dayton Chapter Meeting

was an orderly and interesting presentation of the subject of "Wear and Wear Testing".

Laboratory Equipment Offered

The complete laboratory equipment and working library of the late William J. Jeffries, a member of the New Jersey Chapter A.S.M. who died last September, is offered for sale. The laboratory inventory includes equipment for specimen preparation, analytical processes and chemical laboratory equipment, as well as several cabinets of chemical reagents. The library contains over 200 volumes, most of them in the field of metallurgy.

Anyone interested in purchasing this equipment may secure further details from Mr. Jeffries' daughter, Mrs. Naomi J. Davis, 29 Perry St., Cape May, N. J.

Mathematics of Diffusion Clarified for Students; Job Prospects Appraised

Reported by Frank D. Malone
Washburn Wire Co.

"Students' Night" for the New York Chapter A.S.M. on Dec. 12 featured the subject of "Diffusion in Metals", with an outstanding authority as lecturer in the person of Frederick Seitz of University of Illinois.

Beginning with the mathematical statement of Fick's law of diffusion, Professor Seitz proceeded to show how the coefficient of diffusion of this equation is linearly related to the interatomic spacing and to a factor known as the "jump frequency". This latter variable, being in a sense a measure of the ability of a diffusing atom to change its place in the solute lattice, is an exponential function of both energy requirements and the reciprocal of the absolute temperature. As a consequence, one should expect that a plot of log coefficient of diffusion vs. $1/T$ would be a straight line. Dr. Seitz showed that this has been experimentally confirmed.

Furthermore, the conduction in solid salts obeys a similar relationship to the temperature, and a plot of experimentally determined data becomes a straight line at higher temperatures. The deviation from a straight line at lower temperatures was found to be caused by the presence of small amounts of impurities.

It was interesting to learn that the ionic conductivity is closely related to diffusion by an equation derived by Einstein. Values of the coefficient of diffusion calculated from this equation, when plotted logarithmically against $1/T$, give a straight line, which is in agreement with data experimentally determined.

There are three theoretical mechanisms by which diffusion takes place, Dr. Seitz pointed out. These are (a) interchange of atoms, (b) movement through lattice interstices, and (c) diffusion of vacancies.

The interest of the members in this most stimulating lecture and Dr. Seitz's ability to clarify a rather involved subject were amply attested to by the discussion period that followed.

John T. Norton of Massachusetts Institute of Technology, technical chairman for this meeting, addressed the students before introducing Dr. Seitz. He noted the diversity of abilities (other than purely metallurgical) that the present-day metallurgist is required to exercise. Among these are chemistry, physics, mechanics and mathematics. While a recent survey indicated that the number of metallurgical graduates exceeds the demand, he said, metallurgists are employed in a very large

number of industries. A further encouraging note is found in the statistic that the average earnings of metallurgists are higher than those of other engineers.

NEW FILMS

Tin Plate

Tin plate is the subject of a new 27-min. sound film in color sponsored by the Weirton Steel Co. of Weirton, West Va., in cooperation with the United States Bureau of Mines. Produced by Atlas Film Corp., it depicts step by step the making of tin plate from raw materials to the finished product, with narration in nontechnical language.

It is available for distribution to societies and other organizations, through the film library of the United States Bureau of Mines at Pittsburgh.

Alloy Steel

Bethlehem Steel Co. has released a new sound motion picture in black and white entitled "Alloy Steels—a Picture of Controlled Production". Showing time is 43 min., and the film is available in both 16 and 35 mm.

"Alloy Steels" may be borrowed, free of charge except for prepaid return shipment, by writing to the Publications Department, Bethlehem Steel Co., Bethlehem, Pa. (or, on the West Coast, to Bethlehem Pacific Coast Steel Corp., 20th and Illinois St., San Francisco.)

Stud Welding

An 18-min. color sound movie entitled "Split-Second Fastening", just completed for the Nelson Stud Welding Division of Morton Gregory Corp., illustrates stud welding's part in the current drive to cut production costs. Bookings can be arranged by technical societies and similar groups either through local Nelson field engineers and distributors or by writing to the Nelson Stud Welding Division, Lorain, Ohio.

White Enamel

"White Magic" is a 30-min., 16-mm. sound movie in color, showing the latest techniques in the production, use, and spray application of "Dulux" white enamel for home appliances. Showings may be arranged by writing to E. I. du Pont de Nemours & Co., Finishes Division, Wilmington, Del.

Speaker Available

Claus C. Goetzel, vice-president and director of research, Sintercast Corp. of America, and adjunct professor of chemical engineering, New York University, will be happy to accept invitations from A.S.M. chapters for a talk on the subject of powder metallurgy.

Powder Metallurgy More Art Than Science—Larsen

Reported by Charles W. Hoover
Perfect Circle Corp.

"Powder metallurgy is still more of an art than a science," said E. I. Larsen, executive metallurgical engineer of P. R. Mallory and Co., speaking before the Muncie Chapter A.S.M. on Jan 10. This is because of the large number of variables that have not yet been brought under control.

Despite these variables, the industry has made great strides in recent years, the speaker continued. The art itself is probably as old as the pyramids, but did not come to the industrial forefront until the introduction of tungsten filaments. Fabrication of tungsten and other extremely high melting metals just could not be done in any other way. Practically all of the metals common to industry, as well as the rarer ones, lend themselves to powder metallurgy methods, however.

Manufacturing consists mainly of putting the unadulterated metal powders or alloy powders, with or without special binders, into a die, exerting pressures as high as 60 tons per sq. in. on the compact, and then sintering the green compact at just below the melting temperatures of the constituents in a reducing atmosphere. With this simplest of procedures tolerances can be held around ± 0.003 in. An additional coining operation and possible heat treatment can bring the tolerances down around ± 0.0001 in.

Limitations to the process are that small lots are impractical to deal with, and that the lateral dimensions of the piece must be exactly vertical. Also, parts fabricated on automatic presses are limited to approximately 3 in. for the greatest dimension. Split dies for complicated designs can be used, but the advantage of lower production cost of the other method might be offset.

Parts can be produced from powder to have 80 to 90% of the mechanical properties of the metals fabricated in the usual way; they can be used in any place where high stresses are not important.

Editor Speaks on Stainless

Reported by G. W. Birdsall
Reynolds Metals Co.

E. E. Thum, editor of *Metal Progress*, presented a talk on stainless steels at the January meeting of the Louisville Chapter A.S.M. Mr. Thum's talk was reported in detail in the January issue of *METALS REVIEW*, page 54.

Nondestructive Test Methods Preclude Service Failures

Reported by D. W. Grobecker

Metallurgical Engineer
Los Alamos Scientific Laboratory

A joint dinner meeting of the Los Alamos Chapter A.S.M. and the Society for Non-Destructive Testing on Dec. 19 was addressed by Leslie W. Ball, national president of the latter society. Dr. Ball, who is chief of the mechanical evaluation division, U.S. Naval Ordnance Laboratory, spoke on "Nondestructive Testing in Metallurgy and in the Management of Research, Engineering and Production".

Work at the Naval Ordnance Laboratory, Dr. Ball explained, is broken down into basic academic research, engineering, and independent evaluation of naval weapons. The latter group utilizes many nondestructive testing techniques in connection with both field and laboratory tests of the serviceability of weapon components. Nondestructive tests made subsequent to treatment under simulated service conditions often serve to determine the possible causes for service failures of weapon components, and thus point the way toward correcting the difficulty.

Dr. Ball emphasized the importance of an understanding by metallurgists, engineers and manufacturers of the nondestructive testing techniques. Much time and money have been wasted because responsible people do not realize the variety of information obtainable through nondestructive testing.

To illustrate this point Dr. Ball showed slides of three different weapon components which had failed to meet the desired performance specifications. A great deal of time had been spent in the redesign of the

components in attempts to prevent these failures. When nondestructive testing aid was finally sought, within a few hours radiographs showed the causes of the spurious failures, clearly illustrated the remedy, and showed that the time and money expended on redesign had been wasted.

Good management of all engineering development or material fabrication projects requires that at least one member of the team of metallurgical, mechanical, electronic and chemical engineers be familiar with the great variety of nondestructive testing techniques, and that he be always alert for their application to his own projects.

Republic Promotes Geerts

Louis Geerts, immediate past chairman of the Boston Chapter A.S.M., has been appointed assistant district sales manager of Republic Steel Corp.'s eastern sales district. He will have charge of the Boston territory, serving Maine, New Hampshire, Vermont, Rhode Island and part of Massachusetts.

Mr. Geerts was Boston sales representative for the Union Drawn Steel Co. from 1922 until 1930, when that company was merged to create Republic Steel Corp. He has remained on the Republic sales staff since that time.

ALLOY STEEL



Quick Shipment

You get a three-way guarantee of satisfaction when you buy alloy steel from Ryerson. Your order is filled from stocks of selected quality—steels that have met performance requirements under rigid Ryerson testing. Ryerson delivers your alloys with a complete guide to heat treatment. *No other source offers you so complete an alloy service.* Contact our nearest plant.

Joseph T. Ryerson & Son, Inc. Plants at: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles, San Francisco.

RYERSON

Engineers' Registry to Close

March 15, 1950, has been announced as the closing date for the nationwide survey of selected engineering personnel now being sponsored by the Engineers Joint Council for the U. S. Office of Naval Research. Some 115,000 questionnaires were sent to members of 18 national engineering societies, including the American Society for Metals.

After processing by the American Society of Mechanical Engineers, contracting agent under an O.N.R. agreement, the questionnaires will be kept in Washington as a source file of the nation's key engineers and scientists. The body of facts gathered by the survey will be available to Government agencies, private industrial, educational and professional society planning groups, and for other legitimate purposes.



CHAPTER MEETING CALENDAR



CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	March 8	University Club	O. J. Horger	Why Metals Fracture
Baltimore	March 20	Engineers Club	J. P. Graham	Radio-Isotopes
Birmingham	March 7	Hooper's Cafe	R. H. Aborn	Metallurgy of Stainless Steel
Boston	March 3	Hotel Sheraton	C. L. Altenburger	Use of High-Tensile Steel
Buffalo	March 9	Statler Hotel	A. E. Focke	National Officers' Night
Calumet	March 14	Phil Smidt & Son, Whiting, Ind.	Lester O. Braun	Frozen Foods (Ladies' Night)
Canton-Mass.	March 13	Mergus Restaurant	Don Armour	Machinability
Cedar Rapids	March 14	Roosevelt Hotel	A. C. Jameson	Bolts
Chicago	March 13	Furniture Mart Building	G. Vannerholm	Ductile Cast Iron
Cincinnati	March 9	Engineering Society	H. B. Osborn, Jr.	Induction Heating
Cleveland	March 6	Tudor Arms Hotel	J. A. Victoreen	Radioactivity
Columbus	March 14	Fort Hayes Hotel	R. E. Zimmerman	Economics in the Steel Industry
Dayton	March 8	Engineers Club	M. L. Pool	Atomic Tracers as a Metallurgical Tool
Detroit	March 13	Rackham Building	T. C. DuMond	Trends in Materials and Methods
Fort Wayne	March 13	Chamber of Commerce	M. G. Fontana	Corrosion Resistance of Stainless Steels
Golden Gate	March 27		A. E. Focke	Wear and Wear Testing
Hartford	March 14		G. A. Roberts	High Speed Steel
Indianapolis	March 20	McClarney's Restaurant	L. P. Tarasov	Injury to Ground Surfaces
Los Angeles	March 23	Rodger Young Audit.	A. E. Focke	National Officers' Night
Louisville	March 7		W. H. Oldacre	Metal Cutting and Cutting Compounds
Mahoning Valley	March 14	V.F.W. Hall, Youngstown	A. E. Chester	Electroplating and Porcelain Enameling
Milwaukee	March 21	City Club	W. H. Mayo	Quality Control in Steelmaking
Montreal	March 6	Queen's Hotel	Wayne Besselman	Temperature Measurement and Control
Muncie	March 14	Muncie Central High School	Charles Locke	Foundry Technology and Metallurgy
New Haven	March 16	Actors Colony Inn, Seymour, Conn.	G. A. Roberts	The Role of Carbides in the Heat Treatment of High Speed Steel
New Jersey	March 20	Essex House, Newark	R. M. Burns	Protective Finishes
New York	March 13	Building Trades Club	Blake Crider	Psychology
North Texas	March 15	Dallas	A. J. Langhammer	Recent Progress in Powder Metallurgy
North West	March 16	Covered Wagon, Minneapolis	J. J. Heger	New Developments in Stainless and Alloy Steels
Northwest Pa.	March 23	Corry, Pa.	F. P. Zimmerli	Mechanical Springs—Their Material and Design
Notre Dame	March 8	Engineering Audit., Univ. of Notre Dame	M. A. Snyder	Important Factors in the Grinding of Hardened Steels
Oak Ridge	March 15		J. E. Burke	Recrystallization
Ontario	March 3	Royal York Hotel, Toronto		Ladies' Night
Ottawa Valley	March 7	Carleton College	J. Convey	The Growth and Present Status of Metallurgical Research
Philadelphia	March 31	Franklin Institute	F. B. Foley	Metals at Elevated Temperatures
Pittsburgh	March 9	Roosevelt Hotel		Young Fellows' Night
Puget Sound	March 31	Engineers Club	A. E. Focke	National Officers' Night
Purdue	March 21	Haynes-Stellite Co., Kokomo, Ind.	R. L. Lerch	Recent Developments in Alloys for Resisting Corrosion and High Temperatures
Rhode Island	March 1			
Rochester	March 6		A. E. Focke	The Metallurgist, the A.S.M. and the Metal Industry
Rockford	March 22	Faust Hotel	G. F. Kiefer	Corrosion and Forming of Stainless Steel
Rocky Mtn.	{March 16 March 17	{Pueblo Denver		Student Night
Saginaw Valley	March 21	Frankenmuth	A. T. Colwell	Material Requirements for Jet Propulsion
Springfield	March 20	Hotel Sheraton	C. E. Birchenall	Production and Use of Radioactive Tracers for Metallurgical Research
St. Louis	March 17	Forest Park Hotel	J. C. Fox	Die Casting
Southern Tier	March 13	Hotel Frederick, Endicott, N. Y.	F. J. DeWitt	Corrosion of Metals
Syracuse	March 7		A. E. Focke	National Officers' Night
Terre Haute	March 6			Bearings
Texas	March 6			
Toledo	March 23		A. F. Underwood	Bearings
Tri-City	March 14	Rock Island Arsenal	L. P. Tarasov	Grinding Problems From the Metallurgical Viewpoint
Utah	March 23	Salt Lake City	J. C. Hurst	Copper and Brass Alloys

Warren	March 9	El Rio Restaurant	W. R. Weaver	Steel Conservation and Quality Control
Washington	March 16	Pepco Auditorium		Movie Night
West Mich.	March 20	Morton House, Grand Rapids	E. H. Dix, Jr.	Forming and Cold Working of Aluminum and Aluminum Alloys
Western Ont.	March 10	Wm. Pitt Hotel, Chatham		Stump the Experts Night
Wichita	March 21	K. of C. Hall	{ Dr. Post John Koch	Heat Treatment Purchase of Steel
Worcester	March 8	Aurora Hotel	J. W. Gulliksen	Metal Stampings
York	March 8	Lancaster, Pa.		

Zimmerli Speaks on Springs



"Springs" Was the Subject of the December Meeting of the Worcester Chapter A.S.M. Left to right are Leo P. Tarasov, Norton Co., past chapter chairman; Harold J. Elmendorf, American Steel & Wire Co., technical chairman; F. P. Zimmerli, Barnes-Gibson-Raymond Division of Associated Spring Corp., the speaker; and Orum R. Kerst, E. F. Houghton & Co., chapter chairman. (Reported by Weston J. Russell)

Strength at High Heat Is Chief Advantage Of Postwar "Superalloys"

Reported by A. Floyd Whalen
Metallurgist and Chemist

York Chapter A.S.M. was given an extraordinarily fine presentation of the "Selection of High-Alloy Steel for Heat Resisting Applications" at its December meeting held in Lancaster, Pa. J. B. Henry, of the sales development and engineering service department, Allegheny Ludlum Steel Corp., was the speaker.

Several factors influence the selection of heat resistant alloys, the speaker said, and listed strength at operating temperatures, resistance to progressive scaling or oxidation, the effect of extended exposure to elevated operating temperatures upon the properties of the various alloys, the tendency to warp and crack by thermal expansion, and cost.

Mr. Henry first presented data on the properties of the standard A.I.S.I. straight chromium and chromium-nickel heat resistant alloys, and then

gave comparative data on several of the high-temperature, high-strength "superalloys" developed during the late war, particularly for the highly stressed parts of aircraft gas turbines.

The advantage of these newer alloys lies entirely in the increase of strength at elevated temperatures. High strength ranges up to about 1500° F. for the precipitation hardening and cast alloys, and up to about 1250° F. for the hot-cold worked alloys.

The talk was well illustrated with lantern slides showing comparative stress-rupture, creep and scaling resistance data.

M. P. Adds Two Editors

Two consulting editors appointed to the staff of *Metal Progress*, monthly magazine of the American Society for Metals, are Adolph Bregman and Harold J. Roast. Mr. Bregman will cover the field of cleaning, plating and finishing, and Mr. Roast will serve as an expert on the non-ferrous metallurgical industry. Complete announcement of the two new appointments is carried in the February issue of *Metal Progress*.

IMPORTANT MEETINGS

For March

Feb. 27-March 3—American Society for Testing Materials. Committee Week and Spring Meeting, Hotel William Penn, Pittsburgh. (R. J. Painter, assistant secretary, A.S.T.M., 1916 Race St., Philadelphia 3.)

March 7—Society for Applied Spectroscopy. Talk on Vacuum Ultraviolet Spectroscopy, Socony-Vacuum Training Center, 63 Park Row, New York City.

March 16-17—Pressed Metal Institute. Technical Symposium, Hotel Carter, Cleveland. (Jerry Singleton, P.M.I., 13210 Shaker Square, Cleveland 20.)

March 27-29—International Acetylene Association. Annual Convention, San Francisco. (I.A.S., 30 East 42nd St., New York 17.)

Metal Strength Could Be Vastly Higher—in Theory

Reported by Ben Dixon

Assistant Sales Manager
Dominion Wheel & Foundries Limited

Theoretically, metals should be much stronger than they actually are, Carl Zapffe told the Ontario Chapter A.S.M. on Jan. 6. Dr. Zapffe, a past chairman of the Baltimore Chapter, is one of the foremost young scientists now conducting special experiments under the sponsorship of the United States Office of Naval Research. Title of his address was "New Concepts of the Solid State".

We are only obtaining a tensile strength representing approximately 1% of the available atomic cohesion, he explained. The theoretical possibility exists of producing metals approximately 10,000% stronger than any now known.

The "micellar theory", as it is known, breaks down metal structures further than the granular structure familiar to metallurgists. This theory was evolved from research begun by the speaker in 1939 on gases in metals. Dr. Zapffe presented this highly technical subject in a practical and convincing manner.

The subsequent discussion period covered subjects of a highly technical nature as well as commercial problems in pickling, welding, and stainless steels.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering,
Scientific and Industrial Journals
and Books Here and Abroad,
Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
W. W. Howell, Technical Abstractor

A GENERAL METALLURGICAL

1A. Scovill's Continuous Brass Mill—the World's Most Modern Mill. L. P. Sperry. *Iron Age*, v. 164, Dec. 22, 1949, p. 59-72.

Details of materials handling; flat-bar, continuous-casting, induction-melting furnaces; rolling mills; annealing furnaces; slitting lines; and spray-pickling lines. (A5, F23, Cu)

2A. Light Metals and National Defense. L. M. Brile. *Light Metal Age*, v. 7, Dec. 1949, p. 9, 18.

Power and ore-supply situation. (A4, B10, Al, Mg)

3A. Economics of Owning a Pressure Die Casting Machine. Part II. Eric James. *Light Metal Age*, v. 7, Dec. 1949, p. 10-12, 22-23, 31-32.

Economic factors involved in deciding whether or not to do one's own die casting or to purchase the die castings needed. (A4, E13)

4A. Liquid Wastes: New Ways To Crack a Common Problem. *Modern Industry*, v. 18, Dec. 15, 1949, p. 44-48.

Varied techniques now in use for disposal and productive utilization. (A8)

5A. The Growing Western Market for Better Graded Scrap. L. S. Dahl. *Western Metals*, v. 7, Dec. 1949, p. 32, 34.

Need for better scrap, and operating problems. (A8)

6A. The Nickel Industry in 1949. Robert C. Stanley. *Metals*, v. 20, Dec. 1949, p. 6-7.

Economic trends. (A4, Ni)

7A. Tin Market Should Be Free With Prices Determined by Supply and Demand. G. W. Simms. *Metals*, v. 20, Dec. 1949, p. 9-10, 12.

Proposed restriction of production of the Malayan tin industry. (A4, Sn)

8A. World Copper Market Outlook Depends Largely on Business Conditions in U.S.A. Chester Beatty. *Metals*, v. 20, Dec. 1949, p. 11-12.

(A4, Cu)

9A. Fontana's Steel Plant Still Growing. James Blane. *Western Machinery and Steel World*, v. 40, Dec. 1949, p. 66-69, 98-99.

Miscellaneous steelmaking and fabrication equipment and procedures. (A5, ST)

10A. Metalworking Prospects for 1950 and Imprints of 1949. *Steel*, v. 126, Jan. 2, 1950, p. 99-108.

An economic forecast and discussion. (A4)

11A. Metalworking Facts and Figures. *Steel*, v. 126, Jan. 2, 1950, p. 123-154.

Statistical data, tabulated and charted. (A4)

METALS REVIEW (18)

Starting with this issue, a new method of classifying the annotations published in the A.S.M. Review of Current Metal Literature is adopted. The new system, developed by a joint committee of the American Society for Metals and the Special Libraries Association, is outlined in some detail on pages 4, 5 and 6.

Annotations are segregated under 19 main subject headings, and each annotation is further coded by symbols indicating the subject matter in more detail. These symbols appear at the end of the abstract and should be referred back to the outline on pages 5 and 6. When both "processes and properties" and "materials" are coded, the processes and properties code symbols appear first, followed by the materials index coding.

The new classification is particularly adapted to a punch-card method of filing literature references. A complete explanation of the system, together with equipment and supplies, will be available in the near future, and will be announced in Metals Review at that time.

12A. Metallurgy. *Steel*, v. 126, Jan. 2, 1950, p. 166-170.

Brief reviews and forecasts: More Realism Recommended to Appraise Powder Metallurgy, W. R. Toepfritz. Super Machining Steels Increase Production, Maurice N. Landis. Popularity of Magnesium Alloys Increasing Rapidly, Charles E. Nelson. Fabrication Improved by Metallurgical Discoveries, Arnold P. Seasholtz. Usefulness of Materials Increased by

Redesigning, C. A. Crawford. Applications of Low-Carbon Drawing Quality Steel Gain, C. L. McCuen. 400-Pound Titanium Ingots Now Common, F. R. Hensel. Theoretical Research Hits New High, R. H. Harrington. Aluminum Bronze Alloys Reveal Great Potentialities, J. F. Klement. Spring Industry Extends Use of Alloy Steels, F. P. Zimmerli. Rationalization of Hardenability Foreseen, B. F. Shepherd. Titanium Developments Spur Heat Treating Furnace Demand, Willard Roth. Weldability of High Heat Alloys Improved, Paul Goetcheus. Metallurgical Research on the Increase, Robert A. Lubker. Lower Die Costs Derived From Carburizing Steels, George V. Luerssen. Does Micellar Theory Portend 10 Million Psi Steel?, Carl A. Zapffe. Ship Plate Steels Subject to Many Mill Variables, W. P. Gerhart. Vacuum Cathodic Etching Aids Metallographers, Don M. McCutcheon. (A general)

13A. Equipment. *Steel*, v. 126, Jan. 2, 1950, p. 190-192, 194, 197, 198.

Brief reviews and forecasts: Envisions Research Aiding Pressure Vessel Industry, Fred L. Plummer. The Amplistat—New Tool for Steel Industry, H. W. Poole. Trend of Progressive Manufacturing Disrupted, Robert E. W. Harrison. Fabricators to Be More Receptive to New Methods, W. C. Denison, Jr. We Must Adapt Our Products To Fit Foreign Requirements, S. Menton. Corrosion-Resistant Metals Cut Equipment Maintenance, Everett C. Gosnell. Flexibility of Induction Heating Emphasized, R. N. Blakeslee. Extensive Use of Low Hydrogen Electrodes Noted, A. N. Kugler, J. I. C. Hydraulic Standards Welcomed by Industry, S. B. Taylor. Higher Standards Increase Product Demand, R. G. Widdows. Portable Power Tools Play Important Cost-Cutting Role, Neil C. Hurley, Jr. Plans for New Mills Now Include Scarfing Machines, A. J. Miller. Machine Shape Cutting Now Universal Process, R. F. Helmkamp. Use of Variable Voltage Drives Increases, R. A. Geuder. Oil Well Drilling Tools Pose Tough Metallurgical Problems, Daniel J. Martin. Blast Cleaning Integrated in Steel Rolling Mills, C. R. Cline. New Technique Invaluable in Making Interference Fits, A. Stewart Murray. "Special" Machines With High Flexible Performance Needed, Oscar L. Bard. Adjustable Voltage System Adds New Speed, A. Novara. Management's No. 1 Problem—Boost Output or Else, George T. Trundle, Jr. Leases Unit for Generating Oxygen on Premises, F. E. Pavlis. Immersion Thermocouple Plays Important Role, Harry F. Walther. New Methods Improve Coupling Performance, John H. Schmid. Improved Products Result From Technical Cooperation, Thomas A. Wilson. (A5)

14A. **Lubrication.** *Steel*, v. 126, Jan. 2, 1950, p. 210-212, 214.

Brief reviews and forecasts: All-Purpose Greases in Great Demand, Joseph A. Rigby. Mechanical Gear Lubrication to Result in Big Savings, Frank L. Gray. Proper Lubricants Needed for Today's Rolling Mills, John P. Critchlow. Apply Cutting Fluids on Basis of Performance, Harry A. Erickson. How To Control Rust in Circulating Oil Systems, Clifford C. Goehring. New Fluids to Expand Use of Friction Drives, A. R. Black. Number of Lubricants to Be Minimized, James G. O'Neill, Jr. Good Lubrication Practice Vital to Efficient Production, E. Ralph Harris. Use of Iron Powder Machine Parts Increasing Steadily, A. J. Langhammer. Select Cutting Fluids on Production Performance, W. C. Lockwood. Bearing Manufacturers Study Lubrication, A. R. Spicacci. Industry Becoming Aware of Importance of Clean Oil, H. V. Miles. Chlorinated Hydrocarbons Aid Cold Forming of Stainless, E. L. H. Bastian. (A5)

15A. **Metal Production.** *Steel*, v. 126, Jan. 2, 1950, p. 224, 226, 228, 230-231, 234, 236-238.

More Obsolete By-Product Coke Plants to Be Replaced, W. A. Leech, Jr. Tap-to-Tap Time Cut by Close Check on Operations, J. L. Bray. New Steel Production Techniques Expected, G. G. Beard. Raw Materials for Steel Industry Much Improved, D. T. Rogers. Southern California Ore Smelted Successfully, F. M. Rich. Motor-Generator Sets Being Replaced by Rectifiers, W. R. Harris. Cost-Cutting Practices Felt by Nonferrous Producers, Austin R. Zender. Trend in Open Hearths Toward Large Furnaces, L. F. Reinartz. Sees Brisk Demand for Zinc Early This Year, Ernest V. Gent. Portability Available in Gas Cutting Equipment, S. D. Baumer. Beryllium Now Readily Available for Designer's Use, N. W. Bass. Coke to Continue in Short Supply, Philip S. Savage. Merchant Furnace Progress Helps Foundry Industry, B. C. Colcord. Sources of Raw Materials Occupy Industry's Attention, C. D. King. Curtailed Steel Operations Help Refractory Studies, H. M. Kraner. Intensified Search for Raw Materials Continues, Charles M. Parker. Abundance of Steel Only Way to Protect Profit System, Cottrell Farrell. Jet Piercing to Aid Processing of Taconite, D. H. Fleming. Nitrogen Degassing Eliminates Porosity Defects, E. F. Kurzinski. Suggests Use of Reformed Gases for Blast Furnaces, S. P. Kinney. Taconite Processing Plant Watched With Interest, E. W. Davis. Clad Metals Help Hold Down Equipment Prices, Robert W. Wolcott. Criteria for Selecting Steel Plant Sites Change, Ralph H. Sweetser. Air-Emplaced Refractories Reach All Parts of Furnace, Harvey N. Barrett, Jr. Billet Size Ingot Practice Improves Cost and Yield, C. F. Ramseyer. Iron Ore Supply Problem Approaches Critical Stage, C. O. Dohrenwend. Difficulties Overcome by Slag Casting Ferro-Alloys, T. W. Merrill. Open-Hearth Shops Install More Basic End Furnaces, Raymond E. Birch. Blast Furnace Practice Faces Revisions, H. A. White. Specialized Refractories Lengthen Furnace Life, S. M. Swain. Advocates Closer Control of Fuel Consumption, Matthew H. Mawhinney. Many Opportunities for Reducing Ingot Costs, H. W. Potter. (A4, C general, D general)

16A. **Metallurgy Continues Progress.** David C. Minton, Jr. *Chemical and Engineering News*, v. 28, Jan. 2, 1950, p. 27-28.

Developments of 1949. (A general)

17A. **Chromium Removal by Ion Exchange and Comments on the Chemistry of Chromium Complexes.** Don E. Bloodgood and Aubrey Strickland. *Water & Sewage Works*, v. 97, Jan. 1950, p. 28-32.

An attempt to develop a method for removing chromium from plating wastes, both for detoxifying the wastes, and for recovering the chromium, by utilizing ion-exchange resins. The resins are effective in removing the chromium from solution, but no satisfactory methods have been developed for regenerating the resins. 10 ref. (A8, Cr)

18A. **Heat Treating; Powder Metallurgy; Stamping; Forming; Forging; Casting.** *Iron Age*, v. 165, Jan. 5, 1950, p. 131-141.

Statistical data on production, operating costs, employment and wages, industry associations, prices, and highlights of '49. (A4)

19A. **Steel Production, Steel Prices, and Markets.** *Iron Age*, v. 165, Jan. 5, 1950, p. 151-163, 166.

Statistical data on output, prices, capacities, world production, and highlights of '49. (A4)

20A. **Welding and Joining; Machining, Tools, Etc.; Fasteners.** *Iron Age*, v. 165, Jan. 5, 1950, p. 183-192, 194, 196.

Production data, operating costs, employment and wages, value of product, industry associations, and highlights of '49. (A4)

21A. **Nonferrous Metals.** *Iron Age*, v. 165, Jan. 5, 1950, p. 211-220, 222, 224.

Statistical data on production, exports and imports, consumption, stocks and orders, prices, and highlights of '49. (A4)

22A. **Material Handling; Power Transmission; Metal Finishing; Testing and Inspection.** *Iron Age*, v. 165, Jan. 5, 1950, p. 245-252, 254, 258, 262.

Statistical data on production, employment and wages, value of product, material prices, industry associations, and highlights of '49. (A4)

23A. **Metal Products—General.** *Iron Age*, v. 165, Jan. 5, 1950, p. 267-276, 278.

Statistical data for automobiles, railroads, farm equipment, housing, appliances, and national income. (A4, T general)

24A. **Ore; Coke & Coal; Pig Iron; Scrap; Refractories.** *Iron Age*, v. 165, Jan. 5, 1950, p. 283-293, 296.

Statistical data on production, stocks and reserves, exports and imports, production capacities, and prices. (A4, B general)

25A. **Economic Leadership and Raw Materials; There is No Easy Road to Security.** George S. Brady. *Ordinance*, v. 34, Jan.-Feb. 1950, p. 249-251.

The industrial materials problem of the U. S., particularly in the event of war. Recommends more emphasis on development of improved and radically different methods for utilization of domestic low-grade ores, for recovery of wastes, etc. (A4)

26A. **Trends in Electrification of American Steel Industry.** L. A. Uman-sky. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part I, 1948, p. 784-795.

Generation and purchase of electric power, character of steel-mill load, frequency, system voltages, rolling-mill drives, auxiliary drives, and electric heating. 17 ref. (A5, F23, ST)

27A. **Aluminum Industries in India and Their Future Prospects.** (In French.) *Journal du Four Electrique et des Industries Electrochimiques*, v. 58, Sept.-Oct. 1949, p. 107-108. (A4, Al)

28A. **Zinc Dust Collected by New System Installed at Pipe Galvanizing Plant.** G. E. Brock and D. B. Shindler. *Steel*, v. 126, Jan. 16, 1950, p. 63. (A8, L16, Zn)

29A. (Book) **Metal Magic: the Story of the American Smelting & Refining Co.** Isaac F. Marcossan. 313 pages. 1949. Farrar, Straus and Co., New York.

Presents history of past 50 years of above company woven with the humor and drama of mining, and close-ups of its fabulous figures. Company operations in various foreign areas. (A2, B12)

30A. (Book) **Reports of the Iron and Steel Committee of the International Labor Organization.** 1949. International Labor Office, Washington Branch, 1825 Jefferson Place, N. W., Washington 6, D. C. \$2.50.

Set of three books contains reports of the third session of the Iron and Steel Committee of the International Labor Organization, held in Geneva, Switzerland, in Nov. 1949. Report No. 1 is a general summary of the iron and steel industry; Report No. 2 deals with guaranteed wages in the industry; and Report No. 3 with technological improvements and their effects on employment. (A6, ST)

B RAW MATERIALS AND ORE PREPARATION

1B. **Sodium Carboxymethyl-Cellulose as a Flocculating Agent for Cyanide Slime Pulp.** Claude A. Seger, Jr., and E. E. Brown. *Canadian Mining and Metallurgical Bulletin*, v. 42, Dec. 1949, p. 655-658.

Experimental data for an ore containing a high percentage of talc. Optimum conditions for settling of lime, cyanide, and Carboxel concentrations. (B14)

2B. **Milling and Roasting at MacLeod-Cockshutt.** R. C. Gegg. *Canadian Mining and Metallurgical Bulletin*, v. 42, Dec. 1949, p. 659-665.

Gold-concentration procedure. Includes flow diagrams. (B13, B15, Au)

3B. **Energy-New Surface Relationship in the Crushing of Solids. III. Application of Gas Adsorption Measurements to an Investigation of Crushing of Quartz.** J. F. Johnson, J. Axelsson, and Edgar L. Piret. *Chemical Engineering Progress (Engineering Section)*, v. 45, Dec. 1949, p. 708-715.

Results of an investigation covering a much wider range of energy input to the material than that previously reported. Crushing of screened particles retained in a steel mortar was accomplished by impact and also by slow compression. Surface areas of the samples were measured by gas adsorption and also by the permeability method. 16 ref. (B13)

4B. **Study: Lead-Zinc Flotation and Gravity Concentration.** *Deco Trefoil*, v. 13, Nov.-Dec. 1949, p. 11-12.

Flowsheet was designed to treat economically approximately 200 tons in 24 hr. of a low-grade dump ore containing lead and zinc values as well as some silver in both sulfide and oxide form. (B14, Pb, Zn)

5B. **Refractory Reactions in Vacuum.** P. D. Johnson. *Industrial Heating*, v. 16, Dec. 1949, p. 2218, 2220. A condensation.

Behavior of various refractories when heated under vacuum for different lengths of time at high tem-

perature. Carbon, zirconia, thorium, molybdenum, and tungsten may be used satisfactorily up to temperatures of at least 2300° C. Magnesia cannot be used above 1600° C., or beryllia above 2100° C. (B19)

6B. Fundamental and Practical Factors in Ammonia Leaching of Nickel and Cobalt Ores. M. H. Caron. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 67-90.

Process was in large-scale operation at Nicaro, Cuba, as an emergency measure during World War II. Hitherto unpublished data on various phases of the method, including conditions for ore reduction, leaching, distillation. Possibilities of further development and results of tests on ores other than the Cuban laterites. (B14, Ni, Co)

7B. Refractory Concrete and Cements. A. E. Williams. *Refractories Journal*, v. 25, Nov. 1949, p. 390-400. Reprinted from *Engineering and Boiler House Review*.

Compositions, procedures, and applications. The materials are suitable for furnace construction and other high-temperature work up to 1600° C. (B19)

8B. Bunker Hill's Flash Grind. Frank McKinley. *The Sidney Uses the Flash Grind, Too. Engineering and Mining Journal*, v. 151, Jan. 1950, p. 64-67.

Contrary to past accepted grinding practice in the Coeur d'Alene lead-zinc flotation plants, Bunker Hill and Sidney mills now use a coarse primary grind. Pb and Zn content of the Bunker Hill tailing now runs about half what it used to. (B13, Pb, Zn)

9B. Strong Dosage Is Remedy in Gold Recovery Problem. Keith Kunze. *Engineering and Mining Journal*, v. 151, Jan. 1950, p. 71.

Mixture used to get clean amalgamation of rusty gold in a heavy sulfide concentrate without "floured" quicksilver. (B14, Au)

10B. Flotation of Gray Iron Ores From the Talladega Area, Alabama. H. G. Iverson. *U. S. Bureau of Mines, Report of Investigations 4570*, Dec. 1949, 18 pages.

Reviews past beneficiation work. Characteristics of the ores. Experimental procedure and results. Distribution of impurities in flotation products. (B14, Fe)

11B. Production of Ferrosilicon in India. (In French.) *Journal du Four Electrique et des Industries Electrochimiques*, v. 58, July-Aug. 1949, p. 80-81.

Present status; methods of production; proposed future developments. (B22, Fe)

12B. New Information Concerning the Fixing Mechanism of Flotation Agents. (In German.) O. Neuhoefler. *Archiv für Metallkunde*, v. 3, Oct. 1949, p. 360-364.

Three distinct processes involved in flotation are: orientation of the collector molecules, fixation in the boundary layer and stabilization of the boundary layer. A new theoretical explanation for the second step is presented. (B14)

13B. Results of Research on Metal-Slag Reactions. (In German.) Willy Oelsen. *Zeitschrift für Erbergbau und Metallhüttenwesen*, v. 2, Nov. 1949, p. 328-334.

Summarizes research since 1932. General theory and specific topics in ferrous and nonferrous metallurgy, including effect of Mn and Si as steel deoxidizers; reactions between

Cu melts and Fe-Cu silicates; deoxidation of Cu melts by Fe and P; effects of Cu silicates and phosphates on Cu melts; heats of formation of alloys and their melts; contribution to metallurgy of Cu and Ta; desulfurization of pig iron with Mn and with soda; formation of double sulfides in alkali sulfide slags; etc. 19 ref. (B21, C general, D general)

14B. Minerals Beneficiation in 1949. S. J. Swainson. *Mining Engineering*, v. 187, Jan. 1950, p. 36-45. New developments. (B14)

15B. Beneficiation on the Range. L. J. Erck. *Mining Engineering*, v. 187, Jan. 1950, p. 51-53.

Reviews 1949 developments in iron-ore beneficiation on the Mesabi range. (B14, Fe)

16B. Measurement of Equilibrium Forces Between an Air Bubble and an Attached Solid in Water. T. M. Morris. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 187, Jan. 1950, p. 91-95.

Forces acting between a small rod, one end of which was made water repellent, adhering to a much larger air bubble in water were measured. An equation is deduced which correlates these forces. Importance of the size of bubbles in a flotation cell is emphasized. (B14)

17B. Northern Rhodesia Mufulira Copper Mines Limited Grinding Tests on Conical Trunnion Overflow and Cylindrical Grate Ball Mills. Jack White. *Mining Engineering; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 187, Jan. 1950, p. 96-97.

Results of testing using ball mills with conical trunnion overflow and cylindrical grate discharge, on identical ore. Object was to determine which mill was the most economical under the particular conditions. (B13, Cu)

18B. The Vanadium Minerals. Part I. Mineral Sources of Vanadium. F. F. Franklin. *Vancorom Review*, v. 6, no. 2, 1949, p. 11-15.

Text supplemented by a table giving geographical location, color, texture, and associated minerals for 39 vanadium minerals. (To be concluded.) (B10, V)

19B. Separability of Solid Substances. (In Russian.) Z. V. Volkova and I. V. Smirnova. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Sept. 1949, p. 985-989.

"Separability" defined as completeness of partition, i.e., by sufficiently small content of particles of heterogeneous composition in mixtures of powders obtained by grinding. Probability of formation of particles of heterogeneous composition and degree of exposure of included and including phases are calculated on the basis of distribution function of powder particles and of grains included in the ground body. (B13)

20B. Useful Life of Rammed Electric-Furnace Linings. (In Russian.) S. D. Skorokhod. *Ogneupory* (Refractories), v. 14, Aug. 1949, p. 362-364.

Addition of steel shavings and ground blast-furnace slag to the refractory mass and use of refractory briquettes at points of highest wear are suggested as means of increasing the useful life. (B19)

21B. (Book) Refractories. Ed. 3. Frederick Harwood Norton. 782 pages. 1949. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. \$8.50.

Fundamental processes of the manufacture and use of refractories. Confined to American practice. New material includes nonplastic casting, hydrostatic molding, hot pressing, laboratory furnaces, properties of

pure refractory materials, refractories for nuclear power generation, and refractories for jet propulsion. (B19)

C

NONFERROUS EXTRACTION AND REFINING

1C. Melting and Casting of Non-Ferrous Metals. *Industrial Heating*, v. 16, Dec. 1949, p. 2164, 2166, 2168. Condensed from paper by G. L. Bailey and W. A. Baker.

Previously abstracted from *Journal of the Institute of Metals*. See item 14C-13, 1949. (C5, E25)

2C. Zinc Metallurgy in 1949. H. R. Hanley. *Journal of Metals* (Technical Section), v. 188, Jan. 1950, p. 16G-16H. New technical developments in desulfurization, retorts, distilling furnaces, continuous distilling, electrolytic treatment, and zinc fuming. (C general, Zn)

3C. Separation of Nickel and Cobalt. M. H. Caron. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 91-103.

Several chemical methods for separating Ni and Co obtained by ammonia leaching. Also an electrolytic method for separating alloys of the two metals. (C28, Ni, Co)

4C. Reflections on the Electrolytic Cells Used in the Production of Aluminum. Bruno B. A. Luzzatto. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 105-121; discussion, p. 121.

Analysis of the electrochemical and thermal aspects of the process. The necessity of striving for a reduction of heat losses, especially those through the upper surface. This can be achieved by use of improved self-baking electrodes as a substitute not only for multiple pre-baked electrodes, but also for conventional self-baking electrodes now in use. (C23, Al)

5C. Fuming Tin Slags. C. W. Jensen. *Mining Magazine*, v. 81, Dec. 1949, p. 337-339.

German technique developed to fume slags without briquetting in a short blast furnace, which results in higher recovery and lower costs. All types of slags can be treated successfully as well as low-grade Bolivian cassiterite concentrates. (C21, Sn)

6C. Preparation of Hyper-Pure Silicon. D. W. Lyon, C. M. Olson, and E. D. Lewis. *Journal of the Electrochemical Society*, v. 96, Dec. 1949, p. 359-363.

Reduction of SiCl₄ with Zn vapor. This reaction, which takes place at 950° C., was carried out in fused-silica apparatus. The product was essentially spectrographically free of metallic impurities and had extremely low electrical conductivity. (C22, Si)

7C. A Two Liquid Phase Distribution Method for the Separation of Metallic Elements. M. Calvin. *U. S. Atomic Energy Commission, AEC-D-2710*; UCRL-407, Aug. 1, 1949, 3 pages. General principles of a liquid-liquid solvent-extraction method. (C28)

8C. Segregation and Liquefaction in Alloys. Albert Portevin and Marc Dannenmuller. *Engineering*, v. 168, Dec. 23, 1949, p. 683-685. A condensation. Previously abstracted from *Journal of the Institute of Metals*. See item 2C-82, 1949. (C28, N12, Pb)

D

FERROUS REDUCTION AND REFINING

1D. Electric Furnaces Now Challenge the Open Hearth. *Steel*, v. 125, Dec. 28, 1949, p. 72, 74.

Summarizes proceedings of 7th annual Electric Furnace Steel Conference of the Iron and Steel Division, AIME, Pittsburgh, Dec. 8-10, 1949. (D5)

2D. Extra Coke Vs. Burden Cut. Kurt Newstaeder. *Blast Furnace and Steel Plant*, v. 37, Dec. 1949, p. 1443-1446.

Two basic methods are used to change the ore-coke ratio in blast-furnace charges. Some operators increase the amount of coke while others increase or decrease the ore charge. Pros and cons of the two methods. (D1)

3D. Manufacture of Sponge Iron—Literature Report No. 2. B. R. Nijhawan and P. K. Gupta. *Journal of Scientific & Industrial Research*, v. 8, Nov. 1949, p. 441-446.

Methods developed by the U. S. Bureau of Mines, the Swedish Wiberg process; and the German Krupp and Krupp-Renn processes. 33 ref. (D8, Fe)

4D. The Thermodynamic Background of Iron and Steel Making Processes. I. The Blast-Furnace. F. D. Richardson and J. H. E. Jeffres. *Journal of the Iron and Steel Institute*, v. 163, Dec. 1949, p. 397-420.

Thermodynamic data available for the main compounds of importance in the blast furnace. Free-energy and heat changes of the most important reactions calculated up to 2000° C.; the manner in which they vary with temperature. Results are applied to processes occurring in the blast furnace. 72 ref. (D1, P12)

5D. A New Blast-Furnace Stock-Rod Gas-Seal. E. J. Walklate. *Journal of the Iron and Steel Institute*, v. 163, Dec. 1949, p. 432.

New equipment which gives much more satisfactory results than that used previously. (D1)

6D. Electric Steel Furnace Meeting: Automatic Controls Increase Furnace Output. *Iron Age*, v. 164, Dec. 29, 1949, p. 43-45.

Abstracts of papers covering advantages of automatic controls in raising output, induction stirring of the bath, and effect of large transformers on rate of production. (D5)

7D. Increased Open Hearth Production by Improved Charging Methods. *Industrial Heating*, v. 16, Dec. 1949, p. 2180, 2182, 2184. Based on paper by R. Tietig, Jr.

Practical recommendations. (D2)

8D. Reladling To Obtain Uniform Bath Composition. J. J. Green. *Journal of Metals* (Technical Section), v. 188, Jan. 1950, p. 16F.

Process used by Universal-Cyclops Steel Corp. on all straight-Cr stainless iron alloys and Cr-Ni stainless grades. A portion of the metal is tapped out, then poured back into the furnace over the lip of the ladle, thus duplicating to some extent, the type of mechanical mixing that occurs during tapping of a heat. This practice has resulted in complete elimination of discrepant results due to an insufficiently mixed bath. (D9, SS)

9D. Results of Optimum Current Control on Electric Furnaces. L. A. Wynd. *Journal of Metals* (Technical

Section), v. 188, Jan. 1950, p. 17-21.

Records of actual heats indicate advantages resulting from automatic current settings, as compared with those obtained with the furnace operator adjusting current settings by hand and by guess. (D5)

10D. Recent Developments in Open-Hearth Furnace Design and Operation. A. H. Leckie. *Engineering*, v. 168, Dec. 2, 1949, p. 599-601; Dec. 9, 1949, p. 627-629.

(D2)

11D. Observations Concerning Desulfurization in a Basic Electric Furnace. (In French.) *Journal du Four Electrique et des Industries Electrochimiques*, v. 58, July-Aug. 1949, p. 87-88.

Factors influencing the process of desulfurization. Basic theory of Schenck is analyzed. (D5)

12D. The Extraction of Manganese-Rich Slags for the Production of Ferro-manganese in the Blast-Furnace Smelting of Ore. (In German.) Jacob Willems and Paul Ischebeck. *Stahl und Eisen*, v. 69, Nov. 10, 1949, p. 809-813.

Recommendations for the production of blast-furnace slags with a favorable Mn-Fe ratio. Experimental method; type of furnace used. (D1)

13D. Solidification of Steel in the Continuous Casting Process. (In German.) Helmut Krainer and Bruno Tarmann. *Stahl und Eisen*, v. 69, Nov. 10, 1949, p. 813-819.

Conditions for successful application of the continuous-casting process. Measurements of heat transfer from ingot to chill mold and cooling water are used for development of optimum chill-mold design. Properties and structures of continuously cast steel ingots. 15 ref. (D9)

14D. The Slag-Reduction Process in the Openhearth Furnace. (In German.) Erich Voogdt. *Stahl und Eisen*, v. 69, Nov. 10, 1949, p. 843-844.

Melting procedure for a high-Si steel. Initial addition of only 4.5 kg. Si per ton of steel permits close control of the melting process. (D2)

15D. The Melting of Basic Electric-Furnace Steel. (In German.) E. Diep-schlag and H. Muller. *Archiv für Metallkunde*, v. 3, Nov. 1949, p. 369-376.

The most important melting methods, reactions that occur in the basic electric arc furnace at various stages of the melting process, and the most desirable melting conditions. The problem of producing high-quality steels from the more readily available iron and steel scrap. Several types of steel can be successfully deoxidized by adding Al at the beginning of the refining process. 42 ref. (D5)

16D. Determination of Slag Viscosity From the Melting Curve of the Steel. (In Russian.) V. T. Braza. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Oct. 1949, p. 1206-1209.

A newly developed immersion viscosimeter. Mathematical theory of this method. Two variations of the apparatus. (D general, P10)

17D. Open Hearth Furnace Charging. Harold Carrington Wood. *Engineer*, v. 188, Dec. 23, 1949, p. 724-726; Dec. 30, 1949, p. 756-757.

Equipment and procedure. Future possibilities. (D2)

18D. Destruction of Steel-Pouring Equipment During Production of High-Quality Steel. (In Russian.) V. P. Remin and A. M. Ruchushkin. *Ogne-upory* (Refractories), v. 14, Aug. 1949, p. 346-349.

Structure of refractory steel-pouring equipment and the effect of its composition on the steel obtained were investigated, especially for ball-bearing steel. (D9, SG-c)

E

FOUNDRY

1E. Melting Practice for Copper-Base Alloys. R. A. Colton. *Foundry*, v. 78, Jan. 1950, p. 56-57, 111, 114.

Reasons for gas porosity and recommended melting practices for the various types. (E10, Cu)

2E. Factors Affecting Development of Ductile Iron. Donald J. Reese. *Foundry*, v. 78, Jan. 1950, p. 58-62, 216-217.

Recent developments in production of ductile iron with emphasis on work of International Nickel. Typical applications. Effects of various alloy additions. (E25, CI)

3E. Problems in Producing Ductile Iron. Max Kuniansky. *Foundry*, v. 78, Jan. 1950, p. 62-64.

Based on application of the process developed by International Nickel Co. Many problems are involved in successful application of the process to production of a variety of castings. (E25, CI)

4E. Mechanized Foundry Makes Farm Implement Castings. Pat Dwyer. *Foundry*, v. 78, Jan. 1950, p. 66-69, 152, 154.

Procedures and equipment. (E general, T3)

5E. Modern Practice in Investment Casting. (Concluded.) Hiram Brown. *Foundry*, v. 78, Jan. 1950, p. 74-79, 182.

Effect of gating, mold temperature, and metal temperature on mechanical properties of castings. (E15)

6E. Steel Foundry Practice in Canada. Part 1. *Canadian Metals and Metallurgical Industries*, v. 12, Dec. 1949, p. 12-15, 32, 34.

How applied research has helped the industry. (E general, CI)

7E. Avoid the Commonplace: How One Western Foundry Met Competition by Developing Specialized Castings. Ray J. Thompson. *Western Metals*, v. 7, Dec. 1949, p. 21-23.

Procedures, equipment, and products of Ampco Metal, Inc., Burbank, Calif. Mechanical properties of eight Ampco alloys. (E general, Cu)

8E. Precision Casting; A Method of Accelerating the Setting of Investments. P. E. Gainsbury. *Metal Industry*, v. 75, Dec. 9, 1949, p. 497.

Technique depends primarily on use of a plaster-of-paris molding flask, in place of one of metal or cardboard. The plaster-of-paris rapidly absorbs excess liquid from the investment slurry, causing rapid hardening of the mold. (E15)

9E. Casting. *Steel*, v. 126, Jan. 2, 1949, p. 171-174.

Brief reviews and forecasts: Oxygen Gives Foundry Furnace Operators More Flexibility. G. E. Belieu. Seal of Approval Protects Buyers of Zinc Die Castings. R. Davison. Cast-Weld Construction Offers Many Economies. John Howe Hall. Caution Urged in Using Nodular Cast Iron. H. A. Schwartz. Higher Quality Castings to Result From Past Research. Charles W. Briggs. Gray Iron Still Very Useful Engineering Material. E. B. Sherwin. Severe-Service Castings in Greater Demand. John W. Juppenlatz. Sees Growth for Die Casting Industry During 1950. R. W. Dively. Foundry Mechanization Continues Expansion. Leon F. Miller. Increased Interest Seen in Shrinkage and Gas Inclusions. Harold J. Roast. Popularity of Ductile Irons Will Expand Rapidly. Raymond L. Collier. Foundries Hit Hard

but Test Still to Come. Oliver Smalley. Greatest Advance Seen in Foundry Annealing Practice, James H. Lansing. Studies Casting of Hollow Sections, C. G. Raible. (E general)

10E. Die-Cast Rotors for Induction Motors. L. C. Packer. *Transactions of the American Institute of Electrical Engineers*, v. 68, 1949, p. 253-260; discussion, p. 260-261.

Problems involved in manufacture. Die casting and machining methods. Cause of stray load losses, processing to reduce them, and suitable test methods. 19 ref. (E13, T1)

11E. Manufacture of Ingot Moulds in Cement Sand. J. G. P. Bruschke. *Foundry Trade Journal*, v. 87, Dec. 15, 1949, p. 705-709. A condensation.

The making of ingot molds of the "slab" type weighing between 2½ and 4½ tons. (E11)

12E. Casting Alloys for Permanent Magnets. Thomas A. Dickinson. *Steel*, v. 126, Jan. 9, 1950, p. 48-50, 74.

Procedures, with special emphasis on the dry-sand casting process of Arnold Engineering Co., Chicago. In contrast to usual casting jobs, the products often should have a strained crystal lattice or coarse granular structure—a characteristic normally considered undesirable. This structure limits the number of practical casting designs. Physical and mechanical property data for several common magnet alloys. (E11, SG-n)

13E. Research on an Aluminum-Silicon-Copper-Magnesium Scrap Cast Alloy, Especially Effects of Iron, Manganese, and Zinc on Shrinkage Behavior of the Alloy. (In German.) Kurt Achenbach. *Neue Giesserei*, v. 36 (new ser., v. 2), Nov. 1949, p. 347-353.

Studies show that Mn, Fe, and Zn are the cause of piping in this alloy and that their simultaneous presence merely augments the piping effect. An alloy for complex and highly stressed castings containing 5% Si, 1.5% Cu, and 0.5% Mg should not contain more than 1.1% Mn + Fe and not more than 0.3% Zn. Increasing the Cu content scarcely affects the undesirable influences of Mn, Fe, and Zn. 12 ref. (E25, Al)

14E. Permanent Molds in Nonferrous Foundries. (In German.) H. Kalpers. *Metall*, v. 3, Oct. 1949, p. 333-334.

The Büßelmann process in which the mold is made of sawdust. Experiences with several kinds of permanent molds. (E12)

15E. Junker Graphite-Bar Melting Furnace With Electrical Resistance Heating for Melting Bronzes. (In Russian.) P. Muller. *Metall*, v. 3, Nov. 1949, p. 381-383.

Design of different sizes of the furnace. Typical results for melting Al bronze. (E10, Cu)

16E. Fluidity of Metal and Methods for Its Determination. (In Russian.) Yu. A. Klyachko and L. L. Kunin. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 15, Oct. 1949, p. 1198-1206.

An improved method for determination. Equations are interpreted for different values of variables. Factors influencing fluidity, such as structure of molten metal, overheating, etc. 17 ref. (E25)

17E. Flasks and Rigging for Steel Castings. John Howe Hall. *Foundry*, v. 78, Jan. 1950, p. 70-73, 205-208.

Various types of flasks, jackets, and bottom boards employed in the steel foundry for making different size castings. (To be concluded.) (E22, CI)

18E. Production Processes; Their Influence on Design. Part 50. Investment Casting. Roger W. Bolz. *Machine Design*, v. 22, Jan. 1950, p. 93-99, 150. (E15)

19E. Trimming Flash With Oil-Hydraulic Presses. W. C. Denison, Jr. *Die Castings*, v. 8, Jan. 1950, p. 47, 59.

Use for removing excess metal from die castings. (E24)

20E. Visit to a Patternmaking Works. *Foundry Trade Journal*, v. 87, Dec. 22, 1949, p. 741-746.

Procedures and equipment of British firm. (E17)

21E. Moulding and Core Sands for Aluminium Castings. (Concluded.) A. W. Brace. *Foundry Trade Journal*, v. 87, Dec. 22, 1949, p. 751-753.

Recommended procedures for sand treatment, dry-sand molds, cores, and core drying. (E18, Al)

22E. Casting a Large Pulley in Aluminium Alloy. W. Wilson and A. Talbot. *Foundry Trade Journal*, v. 87, Dec. 29, 1949, p. 761-770.

Details of an unusual job. (E general, Al)

23E. Example of Gating Practice for Horizontal Moulds. *Foundry Trade Journal*, v. 87, Dec. 29, 1949, p. 779-780. (E22)

24E. The Conversion of Existing Parts for Production by Die Casting. H. K. Barton. *Machinery* (London), v. 75, Dec. 29, 1949, p. 934-941.

Principles of redesign. (E13)

25E. Cracking in Light Castings. H. T. Angus. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Dec. 1949, p. 153-176.

Light castings are defined as thin gray-iron castings used primarily in domestic appliances or building industries. Design of castings; effect of composition; cupola operation; metal temperature of knockout; stacking hot castings on cold; molding; microstructure; and inoculation. Appendix I gives quantitative data from the 12 foundries questioned; Appendix II gives results of cracking and strain-bar tests. (E25, CI)

26E. A Review of Current Hot Blast Cupola Practice. W. J. Driscoll. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Dec. 1949, p. 201-216; discussion, p. 216-219.

Includes numerous diagrams. 14 ref. (E10)

27E. Synthetic Resins as Corebinders. J. J. Sheehan. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Dec. 1949, p. 221-225; discussion, p. 226-233. (E21)

28E. Mechanization and Its Effect on Sand Control. C. S. Johnson. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Dec. 1949, p. 235-243; discussion, p. 243-248.

Elaborately mechanized sand-preparation plants, and sand control problems. (E18)

29E. (Book) Gates and Risers for Castings. Ed. 3. Pat Dwyer. 375 pages. 1949. Penton Publishing Co., Cleveland 13, Ohio. \$6.00.

New material on sleeves and pads, knockout risers, pouring through risers, permanent molds for aluminum, formulas for centrifugal-pouring speeds, magnesium casting systems, vacuum systems, blind risers, risers under pressure, thermotomic feeding, developments in gating malleable iron, and precision casting principles. All material in the previous edition is included. Divided into sections covering gray iron, brass and bronze, aluminum, steel, and malleable iron. (E22)

30E. (Book) Text in Patternmaking. Alexander V. Hanel. 314 pages. 1949. Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee 1, Wis. \$2.96.

First part gives general information as well as pertinent technical

data. The second includes data on molding and pattern allowances, tools used in patternmaking, lumber, supplies, patternmaking machinery, pattern layout, joinery, segmental and staving construction, core prints and core boxes, gear patterns, propeller patterns, and method of using patterns in the foundry. (E17)

31E. (Book) La Fonderie des Alliages Légers et Ultra-Légers. (The Foundry for Light and Ultra-Light Alloys.) A. Caillon. 224 pages. 1949. Service de Documentation et d'Information Technique de l'Aéronautique, 2 rue de la Porte d'Issy, Paris 15, France. 800 fr. Melting of magnesium, melting equipment, foundry molding sands for magnesium, foundry defects, periodic foundry-defect epidemics, running methods, repair by welding of cast Mg pieces, and ideal conditions for the development of a casting. (E general, Al, Mg)

F PRIMARY MECHANICAL WORKING

1F. Manufacturing Controls of Large Steel Forgings. Todd Gardner. *Iron Age*, v. 164, Dec. 29, 1949, p. 46-48.

Heating and cooling, deflaking, and ultrasonic inspection methods. (F22, S13, ST)

2F. An Improved Automatic Gas Fired Forge Furnace. James R. Ross. *Industrial Gas*, v. 28, Dec. 1949, p. 6-7. Furnace used for billet heating at Chevrolet Forge Div., General Motors Corp. (F21)

3F. Rolls and Rolling. Part XI. E. E. Brayshaw. *Blast Furnace and Steel Plant*, v. 37, Dec. 1949, p. 1456-1462. Roll passes for octagonal shapes. (F23)

4F. New Ways of Producing Pipe Cut Costs at Basalt. *Western Metals*, v. 7, Dec. 1949, p. 26-27.

Novel equipment and procedures developed for production of welded steel pipe. (F26)

5F. Recent Developments in Forging Technique. *Machinery* (London), v. 75, Dec. 15, 1949, p. 847-852.

Equipment and procedures of Ford Motor Co.'s Canton, Ohio, plant. (F22)

6F. Comparative Advantages of Modern Soaking Pits. II. (Concluded.) E. A. Brown, Jr. *Industrial Heating*, v. 16, Dec. 1949, p. 2170, 2172, 2174, 2176, 2178.

Bottom two-way-fired and tangentially-fired pits. The effects of capacity considerations and temperature uniformity requirements on soaking pit selection. (F21)

7F. Rolling Mills; German Plant and War-Time Practice. *Iron and Steel*, v. 22, Dec. 1949, p. 635-638. Condensed from BIOS Overall Report No. 15, Section III, "The Ferrous Metal Industry in Germany During the Period 1939-1945", by Geo. Patchin and E. Brewin.

Also deals with forging, drop forging, stamping and drawing, the production of tubes and pressure vessels. (F general)

8F. Large Seamless Steel Tube Mill at Clydesdale. *Engineer*, v. 188, Dec. 9, 1949, p. 664-665; Dec. 16, 1949, p. 698-700. (F26)

9F. Advances in the Field of Cold Rolling of Strip Steel During the Last Decade. (In German.) Anton Pomp. *Stahl und Eisen*, v. 69, Nov. 24, 1949, p. 863-879.

Historical review. 299 ref. (F23, ST)

10F. Cold-Rolling Tests With Longitudinal Tensile Stresses. (In German.) Werner Lueg and Emil Greiner. *Stahl und Eisen*, v. 69, Nov. 24, 1949, p. 879-884.

Tests with four different steels showed that tensile stresses in the steel reduced the rolling pressure of the mill. Back-pull reduces rolling pressure more than the tensile stress on the reel. Longitudinal tensile stresses reduce considerably the total amount of energy required for a given rolling operation. (F23, ST)

11F. Production of Wire and Wire Rods. Kenneth B. Lewis. *Steel*, v. 125, Dec. 26, 1949, p. 58, 60-61, 63-64, 66-67; v. 126, Jan. 9, 1950, p. 66, 68, 71-72, 74; Jan. 16, 1950, p. 70, 73-74, 76, 79.

Processes and equipment used in the manufacture of wire from antiquity to the present day. Includes preliminary cleaning operations. Part II: A variety of modern equipment, including that for the annealing or patenting stop. Part III: Application of Zn coatings, manufacture of special products such as nails and fence, and possible future developments. (F28, J25, L16)

12F. Forging Flexibility Enhanced by Gas-Fired Furnace. James R. Ross. *Steel*, v. 126, Jan. 16, 1950, p. 61-62.

New gas-fired billet heating furnace at Chevrolet Forge Division, General Motors Corp. (F22)

13F. Cold Strip Rolling. Frank H. Slade. *Machinery Lloyd* (Overseas Edition), v. 21, Dec. 17, 1949, p. 80-83, 85, 87.

Procedures for gage reduction of hot-rolled strip steel. Includes pickling, cleaning, annealing, etc. (F23)

G SECONDARY MECHANICAL WORKING

1G. Strip Slitter Installed by Tinerman Cuts Inventory 60%. W. A. Lloyd. *Iron Age*, v. 164, Dec. 22, 1949, p. 78-80.

Installation of a Yoder strip slitter permitted a reduction in inventory from 1,500,000 lb. of 700 sizes of steel strip to 500,000 lb. of 13 basic sizes. Construction and operation of the slitter and auxiliary equipment, including an automatic scrap-handling unit. (G15)

2G. How "Cookie-Cutters" Trim Die Costs. *Modern Industry*, v. 18, Dec. 15, 1949, p. 95-96.

Use of "dinking dies" for cutting stainless steel and duralumin parts from sheet at Boeing Aircraft. Savings as compared with use of conventional dies are large. Special heat treatment makes the cutting edges hard enough. (G2, SS, AI)

3G. Bending Prefabricated Pipe. *Industrial Gas*, v. 28, Dec. 1949, p. 8, 23. Reprinted from *Instrumentation*. Specially designed gas-fired pipe bending furnace. (G6)

4G. Are We Slowpokes at Machining? E. J. Tangerman. *American Machinist*, v. 93, Dec. 29, 1949, p. 55-57.

Recent events which indicate wider horizons in cutting speeds. Need for fundamental research rather than "cut-and-try" in this field. (G17)

5G. Allied Press Equipment Plays Prominent Part in Airplane Production at Boeing. Howard E. Jackson. *Modern Industrial Press*, v. 11, Dec. 1949, p. 20, 22, 30.

Miscellaneous equipment for forming, bending, shearing, punching, milling, welding, heat treating, spray painting. (G1, A5)

6G. Working of Aluminum Into Domestic Wares. Walter Rudolph. *Modern Industrial Press*, v. 11, Dec. 1949, p. 38, 40.

Forming, trimming, and buffing equipment and procedures. (G general, L10, T10, AI)

7G. Metal Forming With the Marform Process. *Light Metal Age*, v. 7, Dec. 1949, p. 16, 34.

New process developed by Glenn L. Martin Co., said to result in savings up to 50%. The principal feature is precision control of the pressure curve during the forming cycle. (G4)

8G. Shape-Cutting With Electronic Tracer. W. O. Springer. *Western Machinery and Steel World*, v. 40, Dec. 1949, p. 88-90.

Multiple flame-cutting setups. (G23)

9G. An Analytical Study of Practical Machining Conditions: The Operational Efficiency of Machining Processes. A. J. Chisholm and J. P. Brown. *Machinery* (London), v. 75, Dec. 15, 1949, p. 856-864; Dec. 22, 1949, p. 891-894.

Technique for studying the efficiency of machining processes. It is possible to obtain a measure of the performance of the cutting tools used, and of the economic efficiency of the cutting conditions chosen for different machining operations. Application to milling of Nimonic heat-resisting alloy. (G17, SG-h)

10G. Measurement of Progressive Errors in Machine Tools by High-Speed Photography. C. Timms. *Machinery* (London), v. 75, Dec. 15, 1949, p. 870-873, 875; *Engineering*, v. 168, Dec. 23, 1949, p. 679-680.

Apparatus and technique. Typical results. (G17)

11G. Sintered Hard Metals Containing Titanium Carbide. E. J. Sandford. *Alloy Metals Review*, v. 7, Dec. 1949, p. 2-11.

Theories advanced to explain the beneficial effect of titanium carbide when machining steel, manufacturing difficulties which arise when this carbide is used, and effect on physical properties and structure. Attempts to completely displace tungsten carbide by other carbides, especially titanium carbide, have failed in alloys used for metal cutting. (G17, SG-j)

12G. Cold-Worked Metals and Fatigue. Richard Saxton. *Metallurgia*, v. 41, Nov. 1949, p. 32-33.

Flow in cold drawing is due to the combined effect of direct pull and circumferential pressure induced during passage through the die. Wear at the entrance of the die causes a ring formation. Methods for eliminating this. (G4, Q7)

13G. Forging and Forming. *Steel*, v. 126, Jan. 2, 1950, p. 175-177.

Brief reviews and forecasts: Shop and Market Served Determine Press Requirements, David C. Verson. Underdrive Presses Afford Maintenance Accessibility, E. A. Irwin. Increased Interest Noted in Large Hydraulic Presses, Howard M. Hubbard. Advanced Die Design Improves Stamping and Forming, John F. Herkenhoff. New Equipment Speeds Hole Piercing, Theo. A. Wiedermann. Pension Squeeze May Raise Prices of Drop Forgings, C. H. Smith, Jr. Impression Die Forging Advances on Three Fronts, W. Naujoks. New Processes and Equipment Seen as Near Future Trend, Bryant Bannister. Trend Noted in Redesign for Stamping, John W. Higgins. Large Size Forgings Require Closer Steel-making Controls, A. P. Spooner. High Hardness and Strengths Trend in Heavy Forgings, A. F. Finkl. Better Forging Tools—Fruits of Research, Eugene C. Clarke. Ultra-

sonic Testing of Forgings Gains During 1949, A. O. Schaefer. Technical Progress Opens New Markets for Hydraulic Presses, R. E. Dillon. Straight Carbon Steel of Precise Hardenability Sought, D. A. Barries. (G general, F general)

14G. Machining. *Steel*, v. 126, Jan. 2, 1950, p. 240, 243, 246, 248, 251-252, 254, 257, 260, 262.

Long Stroke Openside Planer Uses Carbides Efficiently, H. B. Newton. Market Expanded for Precision Band Saw, Leighton Wilkie. Effort-Elimination Economics Plays Important Shop Role, Otto W. Winter. Safety and Ease of Control Simplify Operators' Jobs, W. L. Lewis. Broaching Extended as General Purpose Process, Harry H. Gotberg. Modern Systems for Lapping Make Close Fits Practical, Arthur A. Nichols. Cutting Tool Seen as Big Cost Control Factor, K. R. Beardslee. Scientific Research Speeds up Production, Orlean W. Boston. Over-Age Grinding Machines Don't Pull Their Own Weight, C. Denison Day. Gaging Facilities Keep Pace With Production Lines, Frederick S. Blackall, Jr. Economic Law Sets the Limits on Degree of Mechanization, Robert L. Giebel. "Hot Spot" Machining Boosts Per Hour Production, Sam Tour. Steel Forgings Machined at 1185 Surface Ft. per Min., Walter J. Grimm. Fast Station-Type Machines Have Palletized Fixtures, Ralph E. Cross. Pantograph Milling Machine Does Effective Cam Cutting, George Habicht, Jr. Steel Mill Rolls Are Turned On Tracer Controlled Lathes, Basically New Machine Tools Are Rare Inventions Today, Lucien I. Yeomans. Old Tools Indicate Industry Still Not at Peak Efficiency, Ralph J. Kraut. Lathes Still Our Basic Tools and We Keep Improving Them, B. N. Brockman. Counteract High Labor Costs by Machine Tool Efficiency, Kirke W. Connor. Automatic Handling of Work Is Next Thing on the Agenda, M. A. Hollen-green. Gage Makers Keep Pace With Quality Demands on Industry, Louis Polk. Interest in Tungsten Carbide Chasers Increases, Grayson M. Stickell. Maintenance Cost Is Low if Designers Pay Heed to It, J. H. Beardsley. Rapid Expansion Is Apparent in Use of Coated Abrasives, Frank J. Tone, Jr. Heating of Metal Being Cut Reduces Power Requirements, Francis J. Trecker. Stage Set for Replacement of Obsolete Machine Tools, Walter S. Praeg. Contouring Lathe Cuts Costs on Rolls for Rolling Mills, Alfred Kullman. Many Modern Machine Tools Out-Perform Oldtimers 3 to 1, Charles J. Stillwell. Carbide Punches and Dies Win Rapid Acceptance, W. G. Robbins. New Machine Tools Can Give Anything Carbides Can Take, Herbert H. Pease. Capital Equipment Sales to Be High This Year, Harry E. Conrad. (G17)

15G. Low-Cost Precision Stampings. Thomas A. Dickinson. *Steel Processing*, v. 35, Dec. 1949, p. 638-640.

Procedures and equipment. By finding new uses for war-developed aircraft tooling and gravity-rope drophammer equipment, Stainless Steel Products, Inc., is currently producing a variety of metal stampings from both ferrous and nonferrous alloys (including $\frac{3}{4}$ -in. thick steel plates) with close-tolerance dimensions. (G1)

16G. Die Sinking for Drop Forging. John Mueller. *Steel Processing*, v. 35, Dec. 1949, p. 645-647.

Machines duplicate dies to a high degree of accuracy and are capable of working from a thin metal template, or from a model made of steel, cast iron, brass, cement composition,

- or from a comparatively soft material such as plastic, hardwood, or plaster of paris. (G16, F22)
- 17G. **Tool Selection Cuts Machining Costs.** George T. Fraser. *American Machinist*, v. 94, Jan. 9, 1950, p. 120-123.
Key characteristics of major tool materials. (G17, SG-J, TS)
- 18G. **Deep Drawing of Rectangular and Round Shells.** William P. Von Behren. *Finish*, v. 7, Jan. 1950, p. 23-24, 70, 73.
Basic considerations relating to dies, presses, and operating practice. Emphasis is on ordinary and stainless steels. (G4, ST, SS)
- 19G. **Blanking Sheet Metal Parts With Steel Cutting Rules.** E. Carpenter. *Iron Age*, v. 165, Jan. 12, 1950, p. 51-54.
The dinking die, or steel cutting rule such as used in the printing trade, has proved effective for low-cost blanking of aluminum, magnesium, and stainless-steel sheet-metal shapes. Die construction, press methods, and applications of this cutting technique. (G2, Al, Mg, SS)
- 20G. **A Flame Cutter.** *Engineer*, v. 188 Dec. 9, 1949, p. 681.
Flame-cutting torch claimed to effect large economies in the consumption of industrial gases when cutting ferrous metals. (G22)
- 21G. **The Production of Pointers for Dial Instruments.** R. Fendrich. *Machinery* (London), v. 75, Dec. 22, 1949, p. 907-909.
Stamping procedure. (G3, T8)
- 22G. **Machining Light Alloys.** (In French.) Gaston Laval and Rene Schweyckart. *Revue de l'Aluminium*, v. 26, Nov. 1949, p. 361-369.
Effect of composition of material being machined, tool design and composition, cutting fluids. (G17, Al, Mg)
- 23G. **Oxy-Acetylene and Oxy-Hydrogen Flame Cutting.** (In French.) G. Ancion. *Revue de la Soudure; Lastifdschrift*, v. 5, no. 3, 1949, p. 137-147.
Development, present status, and future prospects. Equipment and procedures; performance data. 14 ref. (G22)
- 24G. **The Design of Cold-Drawn Shapes.** (In German.) Hermann Preussler. *Stahl und Eisen*, v. 69, Nov. 10, 1949, p. 819-824.
Factors to be considered in the design of profile-drawing dies, also operating conditions. Development of dies for different simple and complex cold-drawn pieces. (G4)
- 25G. **Flame Cutting in the Scrap Business.** (In German.) H. Jansen. *Schweissen und Schneiden*, v. 1, Nov. 1949, p. 193-196.
Methods for increasing the economy of acetylene cutting. (G22)
- 26G. **The Processing of Non-Ferrous Sheet Metals in the Stamping Shop.** (In German.) G. Oehler. *Metall*, v. 3, Sept. 1949, p. 283-288.
Directions for the cutting, bending, and deep-drawing of heavy-weight and light-weight sheet metals of different physical properties. Effects of the stamping operations on structures of the metals as well as effects of various factors on cutting speeds. 10 ref. (G1)
- 27G. **Method for Determination of Residual Stresses Caused by Shot Peening.** (In Russian.) L. M. Shkol'nik. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 15, Oct. 1949, p. 1232-1239.
Relations between residual stresses and size of sheet, as well as hardness of the metal treated. Optimum conditions for shot peening are indicated on the basis of the proposed method. (G23, Q25)
- 28G. **Removing Buttonhead Rivets.** M. J. Harris. *Welding Journal*, v. 29, Jan. 1950, p. 51.
Procedure using the standard cutting blowpipe and nozzle. (G22)
- 29G. **Powder-Cutting.** *Welding Journal*, v. 29, Jan. 1950, p. 56.
How powder cutting solved a difficult problem in refinery construction. The inner chamber of a large catalyst tower some five stories high, proved to be 3½ in. too long. It was made of 12% Cr steel, 1 in. thick. As well as shortening the column, it was also necessary to cut eight circles in the inner chamber to allow heat to pass into the outer chamber while the entire tower was stress relieved in position. The holes were welded back after treatment. (G22)
- 30G. **Machinability of Free-Cutting Steels Measured by New "Yardstick".** *Steel*, v. 126, Jan. 16, 1950, p. 80, 82, 84.
Method and apparatus developed at Battelle Memorial Institute for Carnegie-Illinois Steel Corp., and known as the "constant-pressure lathe test". It requires only a short testing time and provides adequate reproducibility of test ratings giving machinability indices that agree closely with tool-life values for large-scale commercial machining operations. (G17, ST, SG-k)
- 31G. **Predicting Machine Capability.** Dorian Shalnin. *Machine Design*, v. 22, Jan. 1950, p. 72-76.
By use of available quality control methods, performance of machine-tools may be readily predicted with accuracy and confidence. (G17, S12)
- 32G. **Machining Corrosion-Resistant Materials.** Malcolm F. Jenkins. *Tool Engineer*, v. 24, Jan. 1950, p. 24-27.
Mechanical properties of the stainless steels and their effects on machinability. Recommendations for cutting, tool angles, set-ups, and machining rates applicable to these materials. Recent research on machining. (G17, SG-g)
- 33G. **Forming High-Nickel Alloys: Drawing—Shearing—Perforating—Spinning.** *Metal Industry*, v. 75, Dec. 23, 1949, p. 531-534; Dec. 30, 1949, p. 561-562.
Die materials and lubricants. Progressive steps in drawing operations and effects of design and materials on tendency to split during deep drawing. Annealing characteristics. Concluding installment: Spinning. (G general, N1)
- 34G. **Proceedings of Moscow Conference on Rapid Methods for Working of Metals.** (In Russian.) B. G. Lyul'chenko. *Stanki i Instrument (Machine Tools and Equipment)*, v. 20, June 1949, p. 1-11.
Miscellaneous fabrication processes. (To be continued.) (G general, F general)
- 35G. **Investigation of Cutting Tools During Fine Turning of Steel.** (In Russian.) B. M. Ashkinazi. *Stanki i Instrument (Machine Tools and Equipment)*, v. 20, Sept. 1949, p. 9-12.
Cutting properties of basic types of cutting tools used for fine machining. Two basic shapes with two types of cutting edge were studied. (G17)
- 36G. **Rational Dimensions of Hard-Alloy Tips for Cutting Tools.** (In Russian.) E. I. Lyubomirskii. *Stanki i Instrument (Machine Tools and Equipment)*, v. 20, Sept. 1949, p. 12-14.
Existing dimensions of tips require revision from the point of view of establishing a more rational relation between width and thickness. Ratios of width to thickness for different purposes. (G-17, SG-j)
- 37G. **Method of Determination of Optimum Wear and Optimum Resistance of Tools on the Basis of Their Wear Curves.** (In Russian.) N. N. Zorev. *Stanki i Instrument (Machine Tools and Equipment)*, v. 20, Sept. 1949, p. 17-18.
- New method. Formulas are derived and interpreted for practical application. (G17, Q9)
- 38G. **Quantity of Heat of Cutting Withdrawn by the Cutting Tool.** (In Russian.) B. T. Prushkov. *Zhurnal Tekhnicheskoi Fiziki (Journal of Technical Physics)*, v. 19, Sept. 1949, p. 1015-1019.
Experimental investigation established that the temperature field of cutting is nonstationary, not only at the tip, but at any point along the length of the tool. Amount of heat withdrawn under conditions of the investigation did not exceed 3.5% of the total heat of cutting. 11 ref. (G17)

H POWDER METALLURGY

- 1H. **Finished Stainless Powder Parts Mass-Produced in Wide Range of Shapes and Sizes.** *Steel*, v. 125, Dec. 26, 1949, p. 55-56.
Compacting and sintering. (H14, H15, SS)
- 2H. **The Formation of Alloys by Diffusion in Powder Metallurgy.** (Concluded.) Pol Duwez. *Powder Metallurgy Bulletin*, v. 4, Nov. 1949, p. 168-174.
See abstract of Part I, item 5C-28, 1949. (H12)
- 3H. **Sintering Carbides by Means of Fugitive Binders.** L. S. Foster, L. W. Forbes, Jr., L. B. Friar, L. S. Moody, and W. H. Smith. *Journal of the American Ceramic Society*, v. 33, Jan. 1, 1950, p. 27-33.
See abstract of U. S. Atomic Energy Commission, AECD-2464, item 5C-11, 1949. (H15)
- 4H. **Preparation of High Strength Shapes From Crystalline Boron.** William W. Wellborn. *U. S. Atomic Energy Commission, AECD-2732*, July 19, 1948, 3 pages.
Powder-metallurgy technique. (H general, B)
- 5H. **Metal-Ceramics.** *Product Engineering*, v. 21, Jan. 1950, p. 141-142.
Condensed from "Metal-Ceramics, A New Field in Powder Metallurgy", by Henry H. Hauner.
Includes tables giving electrical properties of $ZrO_2-Fe_2O_3-Cu$ and TiO_2-Ni compositions; also melting points of metals, their oxides, and silicates. (H general, P15, P12)

J HEAT TREATMENT

- 1J. **Operating Costs Cut and Efficiency Improved by Normalizing Procedure Used in the Manufacture of High-Pressure Gas Cylinders.** L. E. Browne. *Steel*, v. 125, Dec. 26, 1949, p. 53-54.
Equipment and procedure of Taylor-Wharton Iron & Steel Co. A special design of furnace with rapid heating and close temperature control is used. (J24)
- 2J. **Development of Furnaces for Malleable Iron Annealing.** C. H. Martin. *Foundry*, v. 78, Jan. 1950, p. 80-83, 209-213.
Factors which have permitted more efficient and more rapid annealing. Operation of typical equipment. (J23, CI)
- 3J. **Practical Heat Treatment of Tool Steels.** H. B. Chambers. *Canadian Metals and Metallurgical Indus-*

tries, v. 12, Dec. 1949, p. 8-11, 36.

Elements of good hardening technique, with special attention to temperature ranges. (J26, T8)

4J. Some Aspects of Salt Bath Furnaces Discussed in Their Application to the Wire Industry. Part Three. (Concluded.) B. M. Pearson. *Wire Industry*, v. 16, Dec. 1949, p. 973-975.

Spheroidizing heat treatment; salt baths for patenting; German practice; metallurgy of patenting; salt-bath installations and operating results; annealing; processing non-ferrous metals; and operating costs. (J2, J25)

5J. Effect of Homogenising on the Structure and Properties of an Extruded Al-Cu-Mg Alloy. H. A. Unckel. *Metallurgia*, v. 41, Nov. 1949, p. 26-29.

Experimental investigation showing that the transverse tensile properties of extruded Al alloys of the duralumin type are lowered by the presence of strings of inclusions of intermetallic compounds. Effect of a homogenizing treatment before and after extrusion was determined. (J21, Q27, A1)

6J. Induction Heating: Modern Applications in the Non-Ferrous Metal Industry. *Metal Industry*, v. 75, Dec. 9, 1949, p. 498-501.

Applications to brazing, soldering, annealing, and forming. Choice of frequency. (J2, K7, K8)

7J. Heat Treating. *Steel*, v. 126, Jan. 2, 1950, p. 200-202.

Brief reviews and forecasts: Heat Treating Trend Toward Versatility, Howard E. Boyer. Heat Treating Accuracy Matches Precision Machining, Orlo E. Brown, Jr. Induction Heating Rounds to Production Line Manufacture, Frank W. Curtis. More Efficient Radiant Tubes Cut Fuel Costs, J. L. Whitten. New Billet Furnaces Widened Concepts of Metal Heating, E. G. de Coriolls. Heat Processing of Metals May Be Boon to Industry, Frederic O. Hess. Electric Furnaces Used in Variety of Applications, R. M. Cherry. Salt Bath Heat Treating Makes Great Strides, William Adam, Jr. Blended Engineering Skills Improve Furnace Designs, W. H. Holcroft. Flame Hardening Profitable "Tool" for Auto Industry, H. V. Inskeep. (J general)

8J. Articulation of Alloy Steel Fixtures to Withstand Quenching Stresses. II. George C. McCormick. *Industrial Heating*, v. 16, Dec. 1949, p. 2140, 2142, 2144, 2146.

Composite units, articulation in baskets, the quench system and alloy life, alloys for quenching, and the importance of design. (Concluded.) (J26, T5, AY)

9J. Electronic Selective Hardening Affords Flexibility, Speed, Cleanliness and Economy. A. H. Allen. *Steel*, v. 126, Jan. 9, 1950, p. 46-47, 64.

Methods and equipment for hardening a large variety of small steel parts. (J2, ST)

10J. Controlled Atmospheres for Forgings and Tool Steels. Part II. Lester F. Spencer. *Steel Processing*, v. 35, Dec. 1949, p. 649-654, 658-659, 666, 669.

Effects of individual gases composing the five main types of prepared atmospheres. Methods for evaluation of suitability of an atmosphere on the basis of tests on the product metal. Typical results with respect to metallographic structure and hardness. The change-of-weight test. (J2)

11J. Performance of Radiant Tube Furnaces. Ellis A. Dooe. *Steel Processing*, v. 35, Dec. 1949, p. 655-656.

Experiences of Detroit Steel Products Co., in use of the above furnaces for heat treating various steels

over the past 15 years. (J general, ST)

12J. Quench Cracking Factors. D. W. McDowell, Jr. *Iron Age*, v. 165, Jan. 12, 1950, p. 64-67.

Quench cracking in light and heavy-walled low-alloy gun steel. It was found that a definite correlation exists between quench cracking and such variables as carbon content, pouring temperature, ingot size and forging reduction, method of quenching, and finishing temperatures. (J26, AY)

13J. Some Economic Aspects of Radio-Frequency Heating. Lawrence M. Duryee. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part I, 1948, p. 105-112.

Previously abstracted from condensed version in *Engineering*. See item 12a-79, 1948. (J2)

14J. Mercury-Arc Frequency Converter for Induction Heating of Metals. S. R. Durand and J. B. Rice. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part II, 1948, p. 1592-1599.

Theory of operation for converting 3-phase power of commercial system frequencies into single-phase power of 1 kc. 12 ref. (J2)

15J. Protective Atmosphere Annealing of Metals. (In German.) Walter Baukloh. *Metalloberfläche*, v. 3, sec. A, Sept. 1949, p. A165-A170; Nov. 1949, p. A197-A203.

Theory and practice. Part II: Production of the gases, construction of the furnaces used, and the different annealing methods. (J23, J2)

16J. Status of the Induction Hardening of Gear Wheels. Strength and Wear Properties. (In German.) M. Ulrich and H. Glaubitz. *Zeitschrift des vereines Deutscher Ingenieure*, v. 91, Nov. 15, 1949, p. 577-583.

Principles and advantages of the method. The physical properties of induction-hardened wheels compare favorably with those of wheels hardened in the cyanide bath. (J2)

17J. Strength and Wear Properties of Flame-Hardened Gear Wheels. (In German.) M. Ulrich and H. Glaubitz. *Zeitschrift des vereines Deutscher Ingenieure*, v. 91, Nov. 15, 1949, p. 584-587.

Effect of core hardness and depth of the hardened surface on strength properties of gear teeth. Flame hardening is superior to case hardening, and the progressive spinning method of flame hardening is considerably superior to the spot hardening process. (J2)

18J. Fuel-Fired and Electric Furnaces in the Aluminum Industry. Part II. Heating and Heat-Treating Furnaces. (In Italian.) L. Bemporad. *Alluminio*, v. 18, July-Aug. 1949, p. 378-394.

Various types, especially those used for treating of aluminum and its alloys. Operating data. (J general, A1)

19J. Diagram for Determination of Annealability of Steel on the Basis of Critical Rate of Quenching. (In Russian.) I. F. Afonskii. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 15, Sept. 1949, p. 1074-1077.

Diagram is constructed on the basis of existing data, correlating factors involved. It permits rapid determination of rate of cooling of the center of an object of any cross section, quenched in any medium. (J26, ST)

20J. Method of Determination of Critical Rate of Quenching. (In Russian.) M. E. Blanter. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 15, Sept. 1949, p. 1077-1079.

Simple method for experimental determination of the minimum rate

of cooling necessary to obtain the martensite structure. Data indicate existence of a regular relationship between distance to the martensite zone and distance to the semi-martensite zone, from the end of the test bar. Influence of alloying elements on "critical rate of quenching" of different steels. (J26, ST)

21J. Evaluation of Deformability of Steel During Heat Treatment. (In Russian.) R. I. Mochalkin. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 15, Oct. 1949, p. 1229-1232.

Simple method and typical data. (J general, ST)

22J. Induction Hardening of Gears. Gear Tests and Performance. (Excerpts from paper by H. B. Knowlton.) Induction-Hardening Equipment. (Excerpts from paper by H. F. Kincaid.) Induction-Hardening Processes. (Excerpts from paper by John A. Redmond.) *SAE Journal*, v. 58, Jan. 1950, p. 54-62. (To be printed in full in *SAE Quarterly Transactions*.)

Engineering and production advantages over carburizing. Knowlton uses engineering test and service performance data to explain the difference in load-carrying capacity between induction-hardened and carburized gears. Type of equipment and methods used by International Harvester are described by Kincaid. Redmond gives power requirements of the process and shows effect of difference in heating values. (J2, T7)

23J. Heating and Quenching Time Cut by New Machine for Flame Hardening Gears, Cams and Wheels. *Steel*, v. 126, Jan. 16, 1950, p. 84.

Machine, called the Lakeside radial rotary flame hardener, consists of a series of burners directed on the piece, which is mounted in a motor-driven spindle. Work spins at a determined rate of speed as it heats. As soon as the proper temperature is reached, a hydraulic mechanism quenches the work. (J2, T7)

24J. Heat Treatment of Chromium Plate. Allen G. Gray. *Products Finishing*, v. 14, Jan. 1950, p. 50, 52, 54, 56, 58, 60.

Reviews paper by Cloyd A. Snively and Charles L. Faust of Battelle Memorial Institute on the structure of hard chromium plate, which brought out experimental data showing changes that take place in chromium plate as a result of annealing. Effect of base metal, of hydrogen, and of vacuum heat treatment. (J23, L17, Cr)

25J. Advanced Induction Heat Treating Tooling and Methods at Studebaker. William J. Harris. *Production Engineering & Management*, v. 25, Jan. 1950, p. 68-69.

(J2)

26J. Annealing of Whiteheart Malleable Castings; Some Aspects of the Gaseous Process. Fritz Schulte. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Dec. 1949, p. 177-199.

Economic importance of the gaseous annealing process and metallurgical advantages. The special properties of various atmospheres and advantages of gas mixtures obtained by reaction with steam or mixtures of air and steam. A new method enables gas composition to be regulated without use of gas-analysis control instruments. 13 ref. (J23, CI)

27J. Casehardening of Lathe Ways by Induction Heating Using High-Frequency Currents. (In Russian.) E. D. Spivac and E. S. Kagan. *Stanki i Instrument (Machine Tools and Equipment)*, v. 20, Sept. 1949, p. 5-8.

Newly designed equipment of modified cast iron or ordinary gray iron.

Structural features and optimum conditions of operation for different types of cast iron. (J2, T5, CI)

22J. Deep Carburization in a Liquid Bath. (In Russian.) E. M. Morozova and F. R. Florensova. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, Sept. 1949, p. 17-18.

Salt-bath treatment of carbon steel, several bath compositions at 850-900° C. Use of NH_4Cl as activator in baths containing carborundum as the source of carbon, thus eliminating the necessity for cyanide salts and decreasing the cost of the process, while still obtaining a carburized layer 1.5-2.0 mm. deep. (J2, CN)

K

JOINING

1K. Copper Paste Simplifies Brazing on Aer-a-sol Bombs. Karl Wunsch. *Iron Age*, v. 164, Dec. 22, 1949, p. 76-77.

Copper in paste form replaces copper-wire rings. The paste is applied by a gun that deposits it on the part in the form of a ribbon. (K8)

2K. How To Take the "Ifs" Out of Aluminum Welding. *Steel*, v. 125, Dec. 26, 1949, p. 46-48, 56.

Recommendations for more effective shop practice prepared by the Resistance Welding Institute to clear up difficulties encountered in welding aluminum surfaces. (K3, Al)

3K. Phototube Controls R-F Welding. Hubert H. Wittenberg. *Electronics*, v. 23, Jan. 1950, p. 91-93.

In manufacture of picture tubes, a vacuum-tight weld is required in the exhaust tubulation assembly to join copper tubing to a sealing sleeve of Ni-Cr-Fe alloy. Precise automatic control of welding is provided by a phototube that monitors the weld temperature and shuts off the generator $\frac{1}{2}$ sec. after the copper flows. The technique is said to be applicable to other manufacturing processes. (K6, Cu, AY)

4K. Industrial Brazing by Pulse Techniques. J. L. Reinartz. *Electronics*, v. 23, Jan. 1950, p. 78-80.

How extremely high values of peak r.f. power are applied in short-duration pulses to reduce heating by thermal conduction of parts adjacent to or near joint being brazed. System developed for tube manufacture has interesting possibilities for other applications. (K8)

5K. Welded Construction Cuts Broach Cost. J. A. Smithers. *American Machinist*, v. 93, Dec. 29, 1949, p. 65.

40-ton vertical surface broach for machining diesel-locomotive parts. Comparative costs of casting and welding (\$5780 and \$3000). (K general, T5)

6K. Fast Process Welds Aluminum Without Heating. *Modern Metals*, v. 5, Dec. 1949, p. 28-29.

"Koldweld" process developed by General Electric Co., Ltd., in England. It is also applicable to Mg, Cu, Ag, Zn, and other nonferrous metals. (K5, Al)

7K. The Low Hydrogen Type Electrode. J. H. Humberstone. *Canadian Metals and Metallurgical Industries*, v. 12, Dec. 1949, p. 16-19. Reprinted from *Welding Arcs*.

Advantages of this development. Typical results. (K1, T5)

8K. Some Anomalies in the Weldability of High-Tensile Steels. A. J. Elliott and W. I. Pumphrey. *Journal of the Iron and Steel Institute*, v. 163, Dec. 1949, p. 369-377.

Examination of plates rolled from 16 different $\frac{1}{2}\%$ Cr-Mo steel castings, of similar chemical composition but different furnace origin, suggests that the steelmaking process may have a considerable influence on weldability. In particular, the results indicate that the weldability of the basic electric steels is superior to that of the basic openhearth steels. (K9, CI)

9K. Joining and Welding. *Steel*, v. 126, Jan. 2, 1950, p. 179-183.

Brief reviews and forecasts: New Metallic-Arc Process Efficiently Welds Stainless, Frank Aschenbrenner. High Frequency Pipe Welding—Outstanding Development, G. N. Sieger. Cold Welding Nonferrous Metals Gets Attention, Robert E. Kinkead. Structural Work Improved With High Tensile Bolts, Herman H. Lind. Brazing Gives Designers Versatile Manufacturing Tool, N. M. Salkover. Structural Welding Applications Seen Gaining, Lamotte Grover. "Slope Control" Permits Accurate Current Regulation, J. T. Bailey. Inert-Gas-Shielded Arc Process Aids Auto Makers, R. J. Pilla. Sees Greater Use of Arc Welding This Year, C. I. MacGuffie. Powder Cutting Improvements Cut Costs by 50 Per Cent, E. M. Holub. Changeover Seen in Wire Drawing and Extrusion Dies, Wm. G. Waltermire. Arc Welding To Make Even Greater Progress in Future, A. F. Davis. Use of Silver Brazing Alloys Being Widened, A. M. Setapen. Two Aluminum Welding Methods May Help Cut Costs, G. O. Hoglund. Argon Metal Arc Welding Boosts Aluminum Fabrication, H. T. Herbst. Quality Control in Welding Must not Relax—but Advance, R. B. Lincoln. Up-to-Date Data on Welding Design Needed, A. P. Young. Higher Speeds, Lower Costs Trend in Arc Welding, C. H. Jennings. AC Current May Provide Better Copper Weldments, J. R. Hunter. Great Future Seen for Electric Arc Welding, Pierre Champion. Inert-Gas Shielded Welding Applications Increasing, H. A. Huff, Jr. General Usage—Aim of Current Welding Refinements, E. R. Behnke. Ultrasonic Unit Facilitates Flash Butt Weld Cycles, I. A. Oehler. Heavy Demand for Fasteners to Continue This Year, George A. Tinnerman. (K general)

10K. Beater-Blade Assemblies for Portable Mixers Braze Economically in Electronic Induction Heater. *Industrial Heating*, v. 16, Dec. 1949, p. 2148, 2150. (K8)

11K. Fusion Welded Pressure Vessels. *Industrial Chemist and Chemical Manufacturer*, v. 25, Dec. 1949, p. 547-553.

Provisional British Standard Code for vessels for the chemical and allied industries. It represents a major departure from previously established practice and should lead to marked economies in the use of steel. (K general, T26, S22)

12K. Siphon for Soap Lake. *Welding Engineer*, v. 35, Jan. 1950, p. 17.

Construction of 22-ft. diam. liners for concrete siphon pipe. Steel plates were rolled to the proper curvature and joined by submerged-melt welding. (K1)

13K. Welding Jet Aircraft Engines. Frank G. Harkins. *Welding Engineer*, v. 35, Jan. 1950, p. 18-21.

Precision welding of high-temperature aircraft components involves practically all processes, including induction brazing, inert-arc welding, submerged-arc welding, and resistance-welding. Equipment and procedures of Solar Aircraft Co. (K general, T24)

14K. Bus Cylinder Block Repaired by Welding. Frank Gianelli. *Welding*

Engineer, v. 35, Jan. 1950, p. 24-25.

(K general, T21)

15K. New Subway Cars for New York City. *Welding Engineer*, v. 35, Jan. 1950, p. 26-27, 31.

Welding, finishing, and assembly operations. (K general, T23)

16K. Weldments vs. Castings. Lawrence Naberhaus. *Welding Engineer*, v. 35, Jan. 1950, p. 28-31.

Cost comparisons for several parts produced as a weldment and as a cast-iron structure, in lots of 1, 10, and 50. (K general, E general)

17K. Braze Joints for Mine Ralls. *Welding Engineer*, v. 35, Jan. 1950, p. 32-33.

Equipment and procedures. (K8)

18K. Design Considerations in Resistance Welding. *I. Welding Engineer*, v. 35, Jan. 1950, p. 34-36.

General recommendations. (To be continued.) (K3)

19K. Welded Aluminum Trailer. R. E. Ferris. *Welding Engineer*, v. 35, Jan. 1950, p. 37.

An inert-arc holder mounted on a traveling carriage is used for production welding of trailer roofs from 3S-HH aluminum sheet. (K1, T21, Al)

20K. How To Weld "White Metal". Roland H. Ogden. *Welding Engineer*, v. 35, Jan. 1950, p. 38-40, 42. A condensation.

"White metal" is another name for the Zn-base alloys used to make die castings. Contrary to the opinion of many welders, a broken die casting can be welded, and have the same strength as before. Procedure. (K general, Zn)

21K. Man-Hour and Material Savings Effected by Resistance Welding Jet Engine Components. *Steel*, v. 126, Jan. 9, 1950, p. 58, 61.

Equipment and procedures for joining like and unlike metals. (K3, T25)

22K. Tricky Techniques Help Resistance Welders. Wallace A. Stanley. *American Machinist*, v. 94, Jan. 9, 1950, p. 96-100.

Time and money saving tricks to keep resistance-welding equipment operating at top efficiency. (K3)

23K. Another "Impossible" Repair Saves \$16,000. Leon Mason. *Industry & Welding*, v. 23, Jan. 1950, p. 12-14, 16.

Procedures used for repair of a 3000-ton hydraulic press. (K general, T5)

24K. Welding—America's Leading Maintenance Tool. *Industry & Welding*, v. 23, Jan. 1950, p. 18-22, 24. Miscellaneous applications. (K general)

25K. Quick Repairs Avert Shutdowns. *Industry & Welding*, v. 23, Jan. 1950, p. 32-34.

Repair of cracked gas-compressor water jackets. (K general)

26K. Chain Block Salvaged by Bronze Welding. *Industry & Welding*, v. 23, Jan. 1950, p. 41. (K8)

27K. Resistance-Welding Machine and Power Supply. C. E. Smith. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part II, 1948, p. 995-1003; discussion, p. 1003-1004.

Previously abstracted from *Electrical Engineering*. See item 22a-194, 1948. (K3)

28K. Instrumentation for the Evaluation of the Stability of the Welding Arc. Lauriston P. Winsor, L. McDonald Schetky, and Robert A. Wyant. *Transactions of the American Institute of Electrical Engineers*, v. 68, 1949, p. 525-533.

Previously abstracted from *Electrical Engineering*. See item 22A-229, 1949. (K1)

29K. Stability and Design of Welded Structures of Steel A-52. (In French.) Lucien J. Vandepierre and Alexandre Sariban. *Revue de la Soudure; Lastijdschrift*, v. 5, no. 2, 1949, p. 66-86; no. 3, 1949, p. 148-172.

Results of a comprehensive investigation indicate that, for determination of structural parameters of a welded framework, the same parameters applicable to riveted structures may be used, by adding 13%—said to be the maximum possible difference in stability between these two types of structures. (K general, ST)

30K. Welding of Rails and Resistance to Fatigue of the Welds. (In French.) M. P. Hustin and W. Soete. *Revue de la Soudure; Lastijdschrift*, v. 5, no. 2, 1949, p. 87-105.

Results of experimental investigation applied to welds made by a wide variety of methods. Data show, generally, lower fatigue strength than that indicated by the literature. 14 ref. (K general, Q7)

31K. Riveting of Light Alloys. (In Italian.) *Aluminio*, v. 18, July-Aug. 1949, p. 413-435.

Equipment and procedures. Selection of rivet materials, rivet design, determination of optimum spacing and size of rivets for different situations. Diagrams and descriptions of riveting guns. (K13, A1)

32K. Welding or Hard Soldering. (In German.) J. Kunz. *Schweissen und Schneiden*, v. 1, Oct. 1949, p. 163-170.

The various soldering processes. Metallurgical structures of soldered and welded joints and their relative strength properties. Specific uses of each of the two processes. 11 ref. (K7)

33K. Investigation of the Strength of Welded Aluminum-Alloy Sheets by Means of Tensile and Fatigue Testing. (In German.) O. Graf. *Schweissen und Schneiden*, v. 1, Nov. 1949, p. 183-189.

Results show that gas welded specimens have considerably higher tensile and fatigue strength than the arc welded ones. (K1, K2, Q23)

34K. Gas Welding of Thin Al-Mg Sheets. (In German.) Friedrich Erdmann-Jesnitzer. *Zeitschrift für Metallkunde*, v. 40, Oct. 1949, p. 389-397.

Experiments with different Al-Mg alloys show that a low-Si alloy is most desirable from the standpoint of strength and malleability as well as weldability. (K2, A1, Mg)

35K. Welding Thin Rust and Acid Resistant Sheets. (In German.) W. Hummützsch and A. Schmidt. *Schweißtechnik*, v. 3, Sept. 1949, p. 97-99.

An automatic welding process and an electrode steel (0.10% C, 19.0% Cr, 9.0% Ni, 2.5% Mo, and 0.8% Cb) especially developed for this purpose. The resulting weld is said to be perfectly uniform and equal in strength to the sheet material. (K1, SG-g)

36K. Influence of Microstructure Under the Notch on Impact Strength of Test-Sections. (In Russian.) A. E. Asnis and B. I. Medovar. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1102-1103.

The above was investigated with respect to weldability of clad steel (low-carbon steel clad with a thin layer of Cr-Ni stainless steel). It was found that the structure underneath the notch has a decisive influence on impact strength of the section. (K9, Q6)

37K. Welding High-Nickel Alloys To Other Metals. G. R. Pease and H. B. Bott. *Welding Journal*, v. 29, Jan. 1950, p. 19-26; discussion, p. 26.

Over 70 metallic-arc welded butt joints were prepared and examined

for strength and ductility. They included welds joining monel, Inconel, and commercial nickel to each other, and to several other engineering alloys, including mild steel, 18-8 stainless in four composition ranges, 70-30 cupro-nickel, silicon bronze, and Hastelloy "B". Safest choice of electrodes. (K1, Ni)

38K. Inert-Gas-Shielded Arc-Welding Aluminum Pressure Vessels. A. J. Hopper. *Welding Journal*, v. 29, Jan. 1950, p. 31-35.

Diagrams show weld-groove preparation and weld design. Recommendations with regard to materials, layout and assembly, and preheating. Welding of tube sheets to barrels. (K1, T26, A1)

39K. Shielded Stud Welding of Aluminum Alloys. Edward Dash. *Welding Journal*, v. 29, Jan. 1950, p. 35-36.

History of development of the process, some details of equipment, possible applications. (K1, A1)

40K. Arc Welding of Molybdenum. I. S. Goodman. *Welding Journal*, v. 29, Jan. 1950, p. 37-44.

Submerged arc (or melt) welding offers the best potentialities for sound joints. Inert-gas shielded-arc welding and atomic-hydrogen welding are discussed briefly. Present techniques limit their use to sections less than 1/4 in. thick. (K1, Mo)

41K. Welding Metallurgy—Iron and Steel. Chapter 5. The Structure of Metals. O. H. Henry, G. E. Claussen, and G. E. Linnert. *Welding Journal*, v. 29, Jan. 1950, p. 45-50.

Reprinted from 2nd edition of book. See item 22B-217. (K general, M general, Fe)

42K. More Jobs Repaired by Bronze Welding. W. M. White. *Welding Journal*, v. 29, Jan. 1950, p. 52-53.

Some typical bronze-welded repair jobs. (K8)

43K. Welding High-Carbon Steel. Mark W. Sterner. *Welding Journal*, v. 29, Jan. 1950, p. 54-55.

Adaptation of the manual hidden-arc welding process to fabrication of certain small, nonuniform, high-carbon steel parts. (K1, CN)

44K. Welding Heavy Castings Restores Power Truck Damaged by 150% Overload. J. A. Draxler. *Welding Journal*, v. 29, Jan. 1950, p. 55-56.

Weld repair of platform-support arms broken off by the heavy load. They are Cr-Mo steel castings. (K general, CI)

45K. Spot Welding Nickel and Nickel Alloys. Frank G. Harkins. *Welding Journal*, v. 29, Jan. 1950, p. 38-12S.

Study of weldability of various Ni alloys in dissimilar metal combinations indicates that spot welding can be successful. Material combinations which appear to be metallurgically incompatible with each other, such as monel + mild steel. Tentative welding schedules for the various metal combinations. (K3, Ni)

46K. Electrodes for Spot Welding Galvanized Steel. Harry B. Spore. *Welding Journal*, v. 29, Jan. 1950, p. 31S-36S.

Influence of electrode shape and material on weld characteristics. Appropriate machine settings for each tip shape. (K3)

47K. Welding Galvanized Iron. Linde Tips and Oxy-Acetylene Tips. v. 29, Jan. 1950, p. 21.

Technique. (K general)

48K. Redesign for Projection Welding Cuts Assembly Costs. *Product Engineering*, v. 21, Jan. 1950, p. 100.

Projection welding the drip pan of the Sharples centrifuge. Although a minor part of the apparatus, changes resulted in savings of \$860 for every 1000 units produced. (K3)

49K. Glass-to-Metal Seals. Joseph A. Pask. *Product Engineering*, v. 21, Jan. 1950, p. 129-134.

Design criteria for vacuum-tight seals between glass and metal; physical and chemical characteristics of common glasses and metals; and seals, sealing techniques, and procedures for various applications. 14 ref. (K11)

50K. Design Details for Stud Welding. R. W. Murdock. *Product Engineering*, v. 21, Jan. 1950, p. 135-140.

Minimum plate thicknesses for different sizes of studs; strength of studs; required clearances for the welding gun; methods of stud location; and basic functional advantages of the process. (K1)

51K. New Techniques for Lining Vessels for Protection Against Corrosion. G. C. Carpenter. *Petroleum Processing*, v. 5, Jan. 1950, p. 21-25.

Experiments on methods for applying corrosion resistant liners to refinery vessels. Development of a new stud-welding technique. Plug welding was discontinued in practice and various types of strip welding are now used. Selection of liner materials. (K1, T29)

52K. Notes on the Weldability and Mechanical Properties of Manganese-Vanadium Plate Steel. Part 2. T. W. Merrill. *Vancor Review*, v. 6, no. 2, 1949, p. 7-9, 19.

Results obtained with the Lincoln-weld automatic arc welding machine. Mechanical test data. (K9, AY)

53K. The Evaluation of Chromium-Iron Alloys for Metal Kinescope Cones. Arnold S. Rose and John C. Turnbull. *RCA Review*, v. 10, Dec. 1949, p. 593-599.

A series of tests on alloys containing 17 and 28% Cr which establishes their suitability for sealing to the glasses used in the manufacture of metal-cone kinescopes. These tests were based upon behavior of the alloy during heating to the sealing temperature of 1200° and include microscopic examination of structure, a thermal expansion test, and a seal test. (K11, P11, T8, S8)

54K. Strap Type Welding Fixture. Clement F. Brown. *Tool Engineer*, v. 24, Jan. 1950, p. 36.

Set-up for welding seven steel clips to a curved cast steel member. (K general, CI)

55K. Bimetallic Bonding Gives New Parts Design Possibilities. *SAE Journal*, v. 58, Jan. 1950, p. 32-35. Based on "The Uses of Bonded Bimetallic Components in Modern Automotive Structure and Engine Design" by Charles E. Stevens, Jr.

Aluminum-cast iron combination for bimetallic pistons, gears, bearings, and light-weight housing castings and better performing brake drums. Other combinations discussed are pistons of Alcoa 132A (Lo-Ex) alloy with a Ni-resist insert; and steel-backed Al bearings. (K5, A1, CI)

56K. Today's Pipe Welding Practice. F. C. Fantz. *Heating, Piping & Air Conditioning*, v. 22, Jan. 1950, p. 124-127, 131.

(K general, T27)

57K. Hot Riveting and Upsetting by Electrical Methods. M. Stuart. *Machinery Lloyd* (Overseas Edition), v. 21, Dec. 17, 1949, p. 94-97.

Potential advantages over other methods such as mechanical riveting, copper brazing, and resistance welding. (K13)

58K. Resin-Cored Solders; Performance Test for Plain and Activated Flux Cores. G. L. J. Bailey and H. C. Watkins. *Metal Industry*, v. 75, Dec. 30, 1949, p. 551-554.

Apparatus designed to provide a simple means of distinguishing, by their performance in a soldering test, between plain and activated

resin cores. Examples illustrate possible applications. (K7)

59K. Contribution to Study of the Quality of Spot Welds. (In French.) R. Biais. *Soudure et Techniques Connexes*, v. 3, Sept.-Oct. 1949, p. 189-202. A new method for control of the quality of spot welds in semi-hard steel is characterized by application of torsion to flat spot-welded test specimens. (K3, K9, ST)

60K. Possibility of Application of Different Test Methods to Welded Structures. (In French.) A. Leroy. *Soudure et Techniques Connexes*, v. 3, Sept.-Oct. 1949, p. 203-214. Reviews different test methods, such as destructive, semi-destructive, nondestructive, and X-ray and γ -ray investigation. Applications of each. (K9)

61K. An Example of Construction of a Gas Holder Using Double-Seam Welding. (In French.) R. Guérout. *Soudure et Techniques Connexes*, v. 3, Sept.-Oct. 1949, p. 217-222. A series of drawings and photographs indicates each step of the work. Includes cost analysis. (K3, T26)

62K. Mechanism of Crystallization of Welds During Fusion Welding. (In Russian.) A. A. Slov. *Avto-gennoe Delo* (Welding), Sept. 1949, p. 1-3. Welding with bare and with thickly coated electrodes and automatic welding under a layer of flux. Under the action of mechanical forces, the molten metal arranges itself in the form of waves. This wave motion and crystallization of the metal results in a lamellar structure on the surface of the weld and lines inside the weld metal. Both the welding process and properties of the coated electrodes and fluxes influence the character and frequency of the waves. (K1, N12)

63K. Automatic Welding With a Shielded Arc at High Current Densities. (In Russian.) V. P. Demyantsevich and I. A. Blokh. *Avto-gennoe Delo* (Welding), Sept. 1949, p. 3-6.

When rate of electrode travel corresponds to rate of fusion, current density may be greatly increased. Such current densities require an electrode of small diameter (2-3 mm.). Depth of fusion during welding increases 1.5-2.5 times; because of the increased thickness of metal which may be welded, great economies of electric power consumption are achieved. (K1)

64K. Heat Regulation During Spot Welding. (In Russian.) K. A. Kochergin. *Avto-gennoe Delo* (Welding), Sept. 1949, p. 9-10.

Dependence of tensile strength of spot welds on temperature under the electrode and, thus, on electric-power input to the electrode was investigated. (K3)

65K. Electric-Arc Welding of "Elektron" Alloy in an Argon Atmosphere. (In Russian.) Ts. S. Braude. *Avto-gennoe Delo* (Welding), Sept. 1949, p. 10-14.

Alloy contains 1.23-1.6% Mn; about 0.10% Ca; remainder, Mg. Argon-arc welding of Mg alloys does not require a flux; strength of welded joint is 70-90% that of the base metal; use of backing is recommended; and both alternating and direct (reverse polarity) currents may be used. Optimum welding conditions; mechanical test data. (K1, Mg)

66K. Use of Technological Characteristics of Electrodes for Production Estimates. (In Russian.) A. A. Erokhin. *Avto-gennoe Delo* (Welding), Sept. 1949, p. 14-18.

A series of examples of how technological characteristics affect time required, consumption of electrode materials, and power requirements

for arc welding of individual pieces, thus making production estimation more simple and accurate. 10 ref. (K1)

67K. Experiments on Automatic Welding Under Flux in Chemical Equipment Construction. (In Russian.) L. G. Avrukh. *Avto-gennoe Delo* (Welding), Sept. 1949, p. 18-19.

Use of two different fluxes and various combinations of them in automatic welding of low-carbon and stainless-steel apparatus for the chemical industry. (K1, T29, CN, SS)

68K. Automatic Welding Under Flux of Thin Sheet Steel. (In Russian.) M. Yu. Al'per and Z. A. Dobrotina. *Avto-gennoe Delo* (Welding), Sept. 1949, p. 20-22.

Experimental investigation of automatic welding of low-carbon steel of 2.5, 3.0, and 4.0-mm. thickness with a low-carbon electrode established the value of a flux containing SiO_2 , MnO , TiO_2 , CaF_2 , FeO , and $\text{K}_2\text{O} + \text{Na}_2\text{O}$. This flux guarantees high arc stability without additional superposition of high-frequency current, also a minimum depth of fusion. Optimum welding conditions for each thickness. (K1, CN)

69K. Welding of "Electrorivets" Under Flux Without Need for Piercing the Upper Sheet. (In Russian.) S. A. Egorova, K. L. Mironova, and N. G. Savchenko. *Promyshlennaya Energetika* (Industrial Power), v. 6, Aug. 1949, p. 6-7.

Basic advantages are lack of necessity for punching or drilling holes, high productivity with high-quality work, 20-30% saving of electric power, and marked reduction of power consumption over spot welding. (K1)

70K. Manual Apparatus for Welding Under Flux. (In Russian.) N. E. Nosenko. *Promyshlennaya Energetika* (Industrial Power), v. 6, Aug. 1949, p. 7-8.

Gun-type apparatus. The electrode wire is fed from a loose coil, perhaps 12 in. in diameter. (K1)

71K. (Book) Methods of Joining Pipe. J. E. York. 236 pages. Industrial Press, 148 Lafayette St., New York 13, N. Y. U. S., \$3; Canada and foreign, \$3.40.

Covers all types of pipe joints, including expansion joints. Grouped into chapters on screwed joints for ferrous and brass pipe; flanged pipe joints; welded and brazed pipe joints; methods of joining cast-iron pipe; joints for thin-wall tubes; joints for plumbing and chemical-resistant pipe; joints for other nonferrous pipe. (K general)

CLEANING, COATING AND FINISHING

1L. Automatic Hard Facing Improves Quality, Cuts Costs. Eldon C. Hurt. *American Machinist*, v. 93, Dec. 29, 1949, p. 87-89.

Greater uniformity, reduced alloy consumption, less porosity, smoother deposits, and shorter machining time are claimed for automatic process. (L24)

2L. Finishing Treatments for Magnesium. II. Jerome L. Bleiweis. *American Machinist*, v. 93, Dec. 29, 1949, p. 113.

Purpose, nature of coating, and procedure for the dichromate process and the modified alkali-chromate treatments. (L14, Mg)

3L. Continuous Coating Units. H. W. Lynn. *Blast Furnace and Steel Plant*, v. 37, Dec. 1949, p. 1463-1465.

Hot-dip coil-galvanizing line recently installed by Weirton Steel Co. Successive operations are cold rolling, electrolytic and mechanical cleaning, annealing, flat rolling, galvanizing and associated operations; and final cleaning, leveling, shearing, etc. (L16, A5)

4L. The Nash Automobile Finish. John Wieland. *Industrial Finishing*, v. 26, Dec. 1949, p. 30-32, 34, 36, 38.

How bodies are cleaned, rust-proofed, primed, baked, wet sanded, dried and cleaned again, painted in color, and baked. (L general, T21)

5L. Chemical Dip Polishes Metal to High Luster. *Industrial Finishing*, v. 26, Dec. 1949, p. 56, 58.

Metal products can be given a bright, reflective surface without mechanical or electrical operations by a new process recently developed by Battelle Memorial Institute. The product to be finished is merely dipped into a chemical solution. Metals that can be chemically polished successfully include brass, copper, nickel-silver, Monel, nickel, and aluminum. (L12)

6L. Priming Coat for Light Metals. Gilbert C. Close. *Light Metal Age*, v. 7, Dec. 1949, p. 6-8.

New primer consists merely of ordinary Zn chromate fortified with synthetic resin. Comparative corrosion resistance of Al and Mg panels primed with the new and old materials. (L14, Al, Mg)

7L. Brush Finishing for Appearance and Corrosion Resistance. R. O. Peterson. *Sheet Metal Worker*, v. 41, Dec. 1949, p. 42-43. (L10)

8L. The Application of Phosphate Coating to Wire. H. A. Holden and S. J. Scouse. *Wire Industry*, v. 16, Dec. 1949, p. 969-971.

Recommended procedures. (L14)

9L. Properties of Gold Deposited at Liquid Air Temperature. P. G. Wilkinson and L. S. Birks. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1168-1171.

Gold deposited in vacuum at liquid-air temperature contained defects and strain. The number of defects and their characteristic decay energy increased rapidly with increasing rate of deposit. The defects decayed with rising temperature but relief of strain did not occur until after most of the defects had disappeared. Electron micrographs showed that the gold film was made up of aggregations of discrete particles rather than a smooth continuous film. (L25, Au)

10L. Recent Advances in Offset Lithography For Metal Decoration. William F. May. *National Lithographer*, v. 56, Dec. 1949, p. 26-27, 75, 77, 81.

Advances of the past 20 years. (L26)

11L. Fifty Years of Metal Decorating. C. W. Dickinson. *National Lithographer*, v. 56, Dec. 1949, p. 28-29, 66.

Equipment for printing on metal at various periods since 1899. (L26)

12L. The Coating Machine; Applying Controlled Finishes. Christian F. Scheehle, Jr. *National Lithographer*, v. 56, Dec. 1949, p. 30-31, 87, 89.

Development of equipment for application of decorative and protective coatings on metal. (L26)

13L. Wonder of the Graphic Arts Inks for Metal Decorating. O. C. Holland. *National Lithographer*, v. 56, Dec. 1949, p. 32-33, 66.

Properties of modern metal-decorating inks. (L26)

14L. The Metal Decorating Oven Today. Oscar Byron. *National Lithographer*, v. 56, Dec. 1949, p. 34-35, 81, 83, 85.

Construction and operation. (L26)

15L. What's Wrong With the Finish? J. E. Hanley and T. R. Brown. *National Lithographer*, v. 56, Dec. 1949, p. 36-37, 94-95.

Troubles that may be encountered in the application of a finish by a roller-coating machine followed by baking in a conventional metal-decorating oven. (L26)

16L. Photo-Composing or Step & Repeat Machines. Michael Annick. *National Lithographer*, v. 56, Dec. 1949, p. 40, 96-97.

Place of the photo-composing machine in the metal-decorating industry. (L26)

17L. Italian Research on Electrodeposition of Metals; The Work of Professor R. Piontelli. *Metallurgia*, v. 41, Nov. 1949, p. 22-25.

The general electrochemical behavior of metals, their behavior in concentration cells, electrodeposition of alloys, and auto-displacement of lead. (L17)

18L. Stainless-Clad Plates: Colvilles' New Process. John Erskine. *British Steelmaker*, v. 15, Dec. 1949, p. 592-596.

New British patented process in which a stainless-steel slab is coated on one side with mild-steel by arc welding. The coated slab is then rolled to the desired thickness. This thin sheet is then bonded to the mild-steel base in the usual manner, with the stainless side out. Mechanical properties of the product. (L22, SS)

19L. Stainless Clad Steels. J. Lomas. *Machinery Lloyd* (Overseas Edition), v. 21, Dec. 3, 1949, p. 75, 77.

Production methods. (L22, SS)

20L. Abrasive Blast Equipment for Cleaning Steel Drums. J. F. Farrell. *Organic Finishing*, v. 10, Dec. 1949, p. 8-10, 21.

Cleaning and reconditioning of steel drums prior to the application of paint or plastic coatings. (L10)

21L. Surface Treatment. Steel. v. 126, Jan. 2, 1950, p. 204-206, 208.

Brief reviews and forecasts: Predicts Infrared Oven Expansion Program, R. J. Carter. New Porcelain Enamel Frits Reduce Material Costs, E. Hogenson. Continuous Strip Annealing to Aid Tin Plate Producers, A. E. Kadell. New Steel Enameling Sheet Eliminates Ground Coat, G. H. McIntyre. Surface Preparation Key to Finishing Progress, C. B. F. Young. Demand Seen for Improved Galvanizing Practice, Wallace G. Imhoff. Industrial Finishes Provide Eye-Appeal, B. F. Ames. Aluminum Wire Industry Makes Great Strides, Henry C. Boynton. Chemical Coating Facilitates Drawing of Stainless Tubing, V. M. Darsey. Sheets Now Are Galvanized by Continuous Process, T. F. Olt. Popularity of Titanium Enamels Gradually Increasing, W. A. Deringer. Galvanizers Review Coating Specifications, Fred C. Brightly, Jr. New Developments to Tumble Metal Finishing Costs, Myron B. Diggins. Better Quality, Lower Cost Demanded of Finishes, Richard O. Loengard. (L general)

22L. The Electrodeposition of Zinc on Zinc Starting Sheets. Glen C. Ware, Henry E. Blake, Jr., and Kenneth B. Higbie. *Journal of the Electrochemical Society*, v. 96, Dec. 1949, p. 335-346.

Conditions necessary for making thick electrodeposits of Zn on zinc starting sheets were investigated in order to eliminate stripping costs and reduce melting losses which occur when using Al starting sheets. Finished cathodes as thick as 2.6 in. were produced on sheets rolled from

four-nines Zn and cathodes as thick as 1 in. on sheets of commercial-grade Zn. (L17, Zn)

23L. Experiments in Chromium Electrodeposition With Radioactive Chromium. Fielding Ogburn and Abner Brenner. *Journal of the Electrochemical Society*, v. 96, Dec. 1949, p. 347-352.

Any used chromic acid electroplating bath contains some trivalent Cr. Whether the metal is deposited from this bath directly from the hexavalent state or through the trivalent state has never been conclusively demonstrated. Tagging the Cr with a radioactive isotope indicates that it is deposited directly from the hexavalent and not from the trivalent state. (L17, Cr)

24L. The Functions and Uses of Hardfacing. Part II. J. J. Barry. *Steel Processing*, v. 35, Dec. 1949, p. 641-644.

Typical applications of each of the four types. (L24)

25L. Large Scale Finishing of Die-Castings. Plating. v. 37, Jan. 1950, p. 44-48.

Procedures and equipment, including buffing, electroplating, and application of paint-type finishes. (L general)

26L. Preparation of High-Carbon Steel for Electroplating. *Plating*, v. 37, Jan. 1950, p. 59-61, 68.

ASTM Tentative Recommended Practice B242-49T. (L17, CN)

27L. Determination of Impurities in Electroplating Solutions. XVI. Traces of Chloride in Copper Plating Baths. Earl J. Serfass and Mary H. Perry. *Plating*, v. 37, Jan. 1950, p. 62-66.

Development of a colorimetric method. Small amounts of Pb, CrO₃, ferric ion, Ca, Al, Na, Ni, Si, or sugar do not interfere. Accuracy is 5%. 23 ref. (L17, S11, Cu)

28L. The German Ferrous Metal Industry; Development of Hard Metals and Coatings. *Chemical Age*, v. 61, Dec. 3, 1949, p. 772-774.

Based on a section of BIOS Overall Report No. 15: "The Ferrous Metal Industry in Germany During the Period 1939-1945". (L24)

29L. Preliminary Report of Developments in Interrupted Surface Finishes. L. S. Martz. *Institution of Mechanical Engineers, Proceedings*, v. 161, War Emergency Proceedings No. 47, 1949, p. 1-5; discussion, p. 6-9.

Results of service use and laboratory tests of three generic types: mechanically, chemically, and electrolytically generated surface finishes and their combinations. Such surfaces are shown to have promise for bearing use. 22 ref. (L general)

30L. Greater Production and Improved Economy by Use of New Galvanizing Settings at Niles Rolling Mill. Eugene Boron. *Industrial Heating*, v. 16, Dec. 1949, p. 2126-2128, 2130, 2132, 2134, 2136, 2254, 2256.

New galvanizing heating equipment. (L16)

31L. Phosphate Coating and Finishing of Tracy Kitchen Cabinets. *Industrial Heating*, v. 16, Dec. 1949, p. 2202-2204, 2206, 2208, 2210-2211, 2213.

Equipment and procedures. (L14, T10)

32L. The Plating Shop "Quick". James E. Bottomley. *Electroplating and Metal Finishing*, v. 3, Dec. 1949, p. 119-120.

The mercury cyanide dip solution is known as the "quick". Periodic determination of the mercury content of three quicking solutions during several weeks of use indicates that there is little danger of the solution becoming too low in Hg content, although too much Hg is harmful. (L17)

33L. Control of Electroplating Solutions by Analysis and Observation. X.

Control of Silver Plating Solutions. X. E. Langford. *Electroplating and Metal Finishing*, v. 3, Dec. 1949, p. 121-122. (L17, Ag)

34L. Anodic Treatment of Aluminum Alloys. Jaime Estruch. *Electroplating and Metal Finishing*, v. 3, Dec. 1949, p. 123-125. An abridged translation of a paper presented at the International Automobile Congress in Turin, Italy.

Three stages in the development of a universal electrolyte are: first, modifications to known electrolytes for the treatment of specific alloys; second, a phosphoric-sulfuric acid electrolyte containing phthalates or phenolates; and third, an electrolyte which cleans, pickles, and brightens simultaneously when the article is made the cathode and which anodizes when the current is reversed—in other words, a one-bath process applicable to all Al-base alloys. (L19, Al)

35L. Determination of Sulphates in Nickel Plating Solutions. V. F. Toropova, F. A. Zimkin, and A. A. Popel. *Electroplating and Metal Finishing*, v. 3, Dec. 1949, p. 132-133.

Previously abstracted from *Zavodskaya Laboratoriya* (Factory Laboratory). See item 8-202, 1949. (L17, S11)

36L. The Hot Spray Process for Organic Finishes. James A. Bede. *Finish*, v. 7, Jan. 1950, p. 25-27, 73-74, 76.

Equipment, effect of materials and spraying technique, and results that may be expected. (L26)

37L. Adherence of Sheet Steel Ground Coats as Influenced by Titanate Mill Additions. Leonard Witt and E. M. King. *Finish*, v. 7, Jan. 1950, p. 28-29.

Data for a wide range of compositions of TiO₂ with Co₂O₃ and NiO. (L27)

38L. Emulsion and Alkaline Cleaning. A. J. Holloway. *Finish*, v. 7, Jan. 1950, p. 53-54, 76.

Previously abstracted from *Better Enameling*. See item 7B-214, 1949. (L12)

39L. Electrodeposited Coatings for Metals. Jerome L. Bleiweis. *American Machinist*, v. 94, Jan. 9, 1950, p. 147.

Essential features of "Corrosizing" and the "Moly-Black" process. (L14, L17)

40L. Metallizing for Maintenance. *Industry & Welding*, v. 23, Jan. 1950, p. 26-27, 30.

Varied applications. (L23)

41L. Metallizing for Corrosive Prevention. John E. Wakefield. *Iron Age*, v. 165, Jan. 12, 1950, p. 55-60.

Characteristics of Zn and Al sprayed coatings and examples of their use on specific products. A new technique for applying a composite coating that is fused after spraying to give a nonporous coating. (L23, Zn, Al)

42L. Formation of Insulating Oxide Films on Electrical Steel. P. L. Schmidt. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part I, 1948, p. 772-774.

Previously abstracted from condensed version in *Electrical Engineering*. See item 7b-109, 1948. (L14, SG-q)

43L. Metal Cleaning Bibliographical Abstracts. Jay C. Harris. *American Society for Testing Materials*, Special Technical Publication No. 90, 1949, 69 pages.

Includes 494 references with abstracts. (L general)

44L. Investigation of Anodic Oxidation of Aluminum by Means of Electrochemical, Volumetric, and Gravimetric Measurements. (In French.) Leo Cavallaro and Gian Paolo Bolognesi. *Re-*

revue de Métallurgie, v. 46, Oct. 1949, p. 689-694.

Evolution of the physicochemical characteristics of the oxidized layer as a function of time of the treatment was studied for 99.5% aluminum (0.27% Fe, 0.19% Si, 0.020% Ca). Method and conditions of investigation. 10 ref. (L19, Al)

45L. Relation Between Aging of Layers of Paint on Metal and Variation of Electromotive Force. (In French.) Raoul Desalme. *Comptes Rendus (France)*, v. 229, Nov. 2, 1949, p. 873-874.

Proposes a new method for determination of the above relation, thus indicating the possibility of evaluation of protective properties of paint by measurement of e.m.f. variation. A schematic drawing shows basic construction of the proposed apparatus. (L26)

46L. The Commercial Production and Use of Precious-Metal Electrodeposits. (In German.) R. Welmer. *Metall*, v. 3, Nov. 1949, p. 376-381.

Methods of production, applications, and limitations of Au, Ag, and Pt electroplated tools and articles. (L17, Au, Ag, Pt)

47L. Bright-Zinc Plating From Alkaline Cyanide Baths. (In German.) Hubert Offermanns. *Metallüberfläche*, v. 1, sec. B, Nov. 1949, p. B121-B123.

Bath compositions and the anodes used. Advantages and a method of further improving the surface of the plated article. (L17, Zn)

48L. Increasing the Corrosion Resistance of Phosphate Films by Subsequent Treatment with Pore-Filling Materials. (In German.) W. Machu. *Archiv für Metallkunde*, v. 3, Oct. 1949, p. 335-340.

Filling the pores of phosphate films on Al and Al alloys with insoluble inorganic compounds reduces the porosity of such films by about 50%. While the addition of inhibitors increases rather than decreases porosity, their use is recommended, since they improve corrosion resistance. Effects of different inorganic compounds were comparatively evaluated. (L14)

49L. Processing Zinc Scrap From Galvanizing Plants. (In German.) E. R. Thews. *Archiv für Metallkunde*, v. 3, Oct. 1949, p. 358-360.

Methods of purifying zinc baths. (L16, Al, Zn)

50L. Steel Dies Inlaid With E Cu ALE. *Welding Journal*, v. 29, Jan. 1950, p. 50.

Dies illustrated are typical examples of the use of "E Cu ALE" electrodes for inlaying draw edges. These electrodes are often used to build up worn die surfaces as well as in the fabrication of new draw dies. (L24, T5, ST)

51L. Automatic Plating Equipment Enables One Operator To Process Thousands of Articles Daily. *Steel*, v. 126, Jan. 16, 1950, p. 87-88.

Equipment and procedures of Westinghouse Electric's new plating division. (L17)

52L. How To Do Bronze-Surfacing. *Linde Tips and Oxy-Acetylene Tips*, v. 20, Jan. 1950, p. 5-7.

Techniques. (L24)

53L. Caloric Stove Corporation Looks Back on Seventy Years in the Stove Business. *Better Enameling*, v. 21, Jan. 1950, p. 8-15.

Forming, pickling, and enameling procedures and equipment. (L27)

54L. Trouble Shootin'. John L. McLaughlin. *Better Enameling*, v. 21, Jan. 1950, p. 37.

Porcelain-enameling defects known as copperheads and scale. (L27)

METALS REVIEW (30)

55L. Design and Use of Burnishing Tools. Herbert C. Lindberg. *Screw Machine Engineering*, v. 11, Jan. 1950, p. 27-29.

Burnishing tools used as attachments on the automatic screw-machine. (L10)

56L. Alloying Process Produces Low-Cost Chromium Case. *Product Engineering*, v. 21, Jan. 1950, p. 146-147.

Both high and low-carbon steels as well as cast iron can be made highly wear, heat, and corrosion resistant by an English process called Chromalloying. The process is similar to conventional pack carburizing and consists of placing parts in a carburizing box containing a Cr-rich powder and heating for approximately 6 hr. (L15, Cr, SG-g)

57L. How Yale & Towne Finishes Materials Handling Machinery. William F. Sorenson. *Products Finishing*, v. 14, Jan. 1950, p. 12-17.

Equipment and procedures. (L general, T5)

58L. Fine Watch Dials Demand Exact Craftsmanship in Fabrication and Finishing. Theodore R. Schwalm. *Products Finishing*, v. 14, Jan. 1950, p. 20-22, 24, 26, 28, 30.

Pleasing contrast and novel effects are created on watch dials, by a combination of mechanical and chemical finishing processes, one of which is a newly developed black nickel plating process. (L general, T9)

59L. Aluminum: Its Surface Preparation and Finishing. Part III. Paint Finishes. E. R. Yarham. *Products Finishing*, v. 14, Jan. 1950, p. 36, 38, 40, 42, 44, 46.

Includes recommended pre-treatments. (L26, Al)

60L. Amorphous Phosphate Coating for Aluminum Alloys. Allen G. Gray. *Products Finishing*, v. 14, Jan. 1950, p. 60, 62, 66, 68, 70.

Reviews paper by Alfred Douty and F. P. Spruance, Jr., on "Alodine" coating, which resists corrosion and also serves as a base for organic coatings. (L14, Al)

61L. Practical Applications of Modern Products. *Products Finishing*, v. 14, Jan. 1950, p. 82-84, 86.

High Speed Continuous Spray Pickling Machines Process Brass at New Scovill Continuous Strip Mill. Permanent Record of Oven Temperatures Obtained With Traveling-Oven Thermometer. Three Complete Finishing Systems Combined to Speed up Oliver Tractor Production. Plastic Coating Protects Silver Plated Terminals and Armatures. (L general)

62L. Buffing Ferrous and Non-Ferrous Metals. Edward Engel. *Tool Engineer*, v. 24, 1950, p. 37-39.

Selection of buffing wheels, wheel life and lubrication. Specific information for common metals and alloys. (L10)

63L. Field Performance of Modern Asphaltic Pipe Coatings. Gordon N. Scott. *Oil and Gas Journal*, v. 48, Jan. 12, 1950, p. 68, 71, 73, 80.

Results of a number of pipe-line surveys made to determine the effectiveness of the protection against corrosion provided by asphaltic coatings in different locations and after different periods since installation. (L26)

64L. Electrodeposition of Alloys of Phosphorus and Nickel or Cobalt. Abner Brenner, Dwight E. Couch, and Eugenia Kellogg Williams. *Plating*, v. 37, Jan. 1950, p. 36-42.

Co-Ni deposits obtained by chemical reduction and containing phosphorus were harder than ordinary electrodeposits of Ni or Co. This

process is uneconomical and attention was directed to electrodeposition of metals with phosphorus. Alloys of Ni or Co containing as much as 15% P were obtained from acid solutions containing phosphites. The deposits are metallic in character and appearance and have good mechanical properties. (To be continued.) (L17, Ni, Co)

65L. Vinyl Coatings for the Metal Decorator. Joseph M. Perrone and Edward R. Lawson. *National Lithographer*, v. 56, Dec. 1949, p. 38-39, 95-96.

Development and properties. (To be continued.) (L26)

66L. The Electro-Colouring of Stainless Steels in Aqueous Solutions. C. E. Naylor. *Plating Notes*, v. 1, Aug. 1949, p. 2-14.

Methods for coloring stainless steels in modified H₂SO₄ solutions were tried. The electrolytic method was found to be superior for production-control purposes. Conditions under which colored films were formed did not correspond with those described by Batcheller; no explanation is known for what appears to be an anomalous effect. (L14, SS)

67L. Highlights of 1949 in Finishing Die Castings. *Die Castings*, v. 8, Jan. 1950, p. 41-42, 44-45.

A review. 16 ref. (L general)

68L. Hard Nickel Plating: Advantages—Applications—Preparation of Base Metal—Formulae. M. H. Orbaugh. *Metal Industry*, v. 75, Dec. 30, 1949, p. 555-556. Condensed from *Metal Finishing*.

(L17, Ni)

69L. Deposition of High-Speed Steel on a Cutting Tool. (In Russian.) I. M. Erofeev. *Stanki i Instrument (Machine Tools and Equipment)*, v. 20, Sept. 1949, p. 18-20.

Method applicable to cutting tools of large cross section, reamers, and milling cutters. Deposition is accomplished by use of an oxyacetylene flame with different degrees of reducibility. Optimum dimensions of cutting edge and optimum deposition conditions. (L24, T6)

70L. Portable Apparatus for Applying Hard-Alloy Tips To Cutting Tools. (In Russian.) V. E. Kulchitskovo. *Promyshlennaya Energetika (Industrial Power)*, v. 6, Aug. 1949, p. 8-9.

Special feature of the apparatus is the addition of a damping resistance which permits changing the thickness of the built-up layer within wide limits. (L24)

71L. (Book) Principles of Electroplating and Electroforming. Ed. 3. William Blum and George B. Hogaboom. 455 pages. 1949. McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. \$6.00.

Principles of electrochemistry and physics that underlie plating processes; developments in the electroplating industry. Verified formulas for all important plating solutions. Recent developments in electrodeposition. Full treatment of each of the commonly used metals, dealt with in the same sequence as in the periodic system. Preparation necessary for deposition on plastics. Deposition of alloys. (L17, L18)

72L. (Book) The Lea Method of Finishing. 161 pages. Lea Manufacturing Co., Waterbury 86, Conn. \$5.00.

Various metal finishes that may be specified and microphotos of the surface after each finish is applied. Methods of producing a variety of finishes on metals, plastic and woods are discussed. Grinding and buffing wheel composition, grinding compounds, etc. Case histories. (L general)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

1M. Distribution of Phases in Two-Phase Solids. Leonard D. Jaffe. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1206-1208.

The quasi-equilibrium distribution of a disperse phase within a polycrystalline phase was investigated by methods of statistical thermodynamics. (M27)

2M. Method for the Quantitative Evaluation of X-Ray Patterns From Mixed Powders. J. C. M. Brentano. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1215-1222.

Basic aspects of some interfering factors, in particular of those which result from superpositions of lines. A correction method is developed and is adapted to cases where the impurities which interfere with the regular patterns are unknown. 34 ref. (M22)

3M. Orientation of Single-Crystal Rods of Copper Grown From the Melt. A. A. Petruskas and F. Gaudry. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1257-1258.

A large number of crystals were grown and their axes plotted. Orientation was found to have random distribution as predicted by theory. (M26, Cu)

4M. Crystal Structure and Phase Transformations. J. Robert Doig. *Metals Review*, v. 22, Dec. 1949, p. 4-6, 24-25.

Fundamental research reported in the literature of the past year or two. (References to A.S.M. Review of Current Metal Literature.) (M general, N general)

5M. Improved Differential Thermal Analysis Apparatus. J. Laurence Kulp and Paul P. Kerr. *American Mineralogist*, v. 34, Nov.-Dec. 1949, p. 839-845.

Modified type permits automatic pen or dot recording with a sensitivity equal to that of galvanometer-photographic recording methods. With a dual furnace assembly virtually continuous operation alternating between multiple and single recording may be accomplished. (M23, Si6)

6M. Investigation of Coarse Grain in Brabazon Spar Booms. *Aircraft Engineering*, v. 21, Dec. 1949, p. 388-389.

Results of etching and tensile tests on Al alloy aircraft parts show superiority of fine-grained material. (M27, T24, Al)

7M. Metallographic Technique. Cornelius A. Johnson. *Frontier*, v. 12, Dec. 1949, p. 16-21.

Elementary outline. Includes typical photomicrographs. (M21)

8M. The Aluminium-Tin Phase Diagram and the Characteristics of Aluminium Alloys Containing Tin as an Alloying Element. A. H. Sulley, H. K. Hardy, and T. J. Heal. *Journal of the Institute of Metals*, v. 76, Nov. 1949, p. 269-294.

The liquidus curve of the Al-Sn system and the solid solubility of Sn in Al were redetermined. Results of metallographic examination, aging tests, and precise lattice-parameter measurements. The metallurgy of Sn as an alloying element in Al alloys. Other elements may combine with tin to form a compound and so suppress its normal effects. 35 ref. (M24, Al, Sn)

9M. Electrolytic Polishing; New Apparatus for Rapid Production of Mi-

crosections. *Metal Industry*, v. 75, Dec. 9, 1949, p. 493, 501.

Commercial apparatus and method of operation. (M21)

10M. The System Chromium-Carbon. David S. Bloom and N. J. Grant. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 41-46.

The Cr-C system, up to 20% C, was investigated using metallographic, X-ray, and thermal analyses. Transformation temperatures pertinent to the three known carbides were examined, resulting in higher temperatures than heretofore given for some of these transformations. Many attempts were made, all unsuccessful, to form a carbide of composition CrC. 10 ref. (M24, Cr, C)

11M. A Preliminary Investigation of the Zirconium-Beryllium System by Powder Metallurgy Methods. Henry H. Hausner and Herbert S. Kalish. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 59-66.

Condition of the specimens after sintering, metallographic examination, and X-ray-diffraction studies revealed enough information to permit construction of a preliminary phase diagram. (M24, H general, Zr, Be)

12M. Method for Studying Grain Boundary Migration in Aluminum. Philip R. Sperry. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 103-104.

Technique. (M27, Al)

13M. Faults in the Structure of Copper-Silicon Alloys. Charles S. Barrett. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 123-135.

Disorders (faults) in the stacking of atomic planes in Cu-Si alloys were detected and analyzed by X-ray diffraction, and the conditions for generating faults determined. They were found in alloys of 4.0-5.4% Si after deformation, when supersaturated. Effects of variations in heat treatment and work. (M26, Cu)

14M. The Alloy Systems Uranium-Aluminum and Uranium-Iron. Paul Gordon and A. R. Kaufmann. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 182-194.

Phase diagrams were determined. For each system several intermetallic compounds occur. Solid solubility in the terminal phases is very limited in all cases. (M24, U)

15M. The Alloy Systems Uranium-Tungsten, Uranium-Tantalum and Tungsten-Tantalum. C. H. Schramm, P. Gordon, and A. R. Kaufmann. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 195-204.

Constitutions of the U-W and U-Ta systems and resulting phase diagrams. Relationship between lattice parameter and composition for Ta-W solid solutions. Two phases of the U-Ta-C ternary system were discovered and described. Experimental induction-melting apparatus. (M24, U, W, Ta)

16M. A New Intermetallic Phase in Alloy Steels. K. W. Andrews. *Nature*, v. 164, Dec. 10, 1949, p. 1015.

X-ray examination of a number of residues separated electrolytically from steels containing Cr, Ni, and Mo revealed the presence of a new phase designated as χ . Results of chemical analysis of a residue containing a large proportion of this phase. Debye-Scherrer powder pho-

tographs show a structure similar to α -manganese. (M27, M22, AY)

17M. Compounds of Uranium With the Transition Metals of the First Long Period. N. C. Baenziger, R. E. Rundle, A. I. Snow, and A. S. Wilson. *U. S. Atomic Energy Commission, AEC-D-2598*, May 25, 1949, 15 pages.

Binary metallic compounds formed with Mn, Fe, Co, Ni, and Cu. Occurrences, structure, and composition. 13 ref. (M26, U)

18M. The Crystal Structures of Metallic Uranium. Charles W. Tucker, Jr. *U. S. Atomic Energy Commission, AEC-D-2716*, July 21, 1949, 14 pages.

The three crystalline forms before melting are: α -phase, stable up to 640° C.; β -phase, stable between 640 and 760° C.; and γ -phase, stable from 760 to the melting point. Some physical properties of the three phases which can be readily interpreted in terms of crystal structure. 10 ref. (M26, U)

19M. The Electron Microscope and Its Application to Metallurgy. (In French.) Adrien Saulnier. *Revue de L'Aluminium*, v. 26, Nov. 1949, p. 358-360.

The electrostatic electron microscope. Techniques of preparation and some of the results recently achieved in the field of Al-Cu alloy hardening. (M21, Al)

20M. Some Applications of Electrolytic Polishing in Micrographic Investigation of Al-Zn and Al-Mg Solid Solutions. (In Italian.) P. Lacombe and A. Berghazan. *Alluminio*, v. 18, July-Aug. 1949, p. 365-377.

Application to study of Al alloys containing 20% Zn and 4% Cu after hardening, aging, and annealing, in an attempt to determine the kinetics of structural hardening. The most important factor was found to be the arrangement and distribution of crystal imperfections. 23 ref. (M21, M26, N7, Al)

21M. Heat Conduction During Phase Transformations. (In German.) Dietrich Geist and Ulrich Dehlinger. *Zeitschrift für Naturforschung*, v. 4a, Sept. 1949, p. 415-423.

General method for solving the heat-conductivity equation. The computations are used to prove that the laminar structures of metal crystals are not directly related to the heat of solidification. 25 ref. (M23)

22M. Electrolytic Polishing of Metal Surfaces and Its Importance in Microhardness Testing. (In German.) K. Longard. *Archiv für Metallkunde*, v. 3, Nov. 1949, p. 381-386.

The work-hardening effect of mechanical polishing makes it impossible to obtain accurate microhardness data. This difficulty is absent in electropolished specimens. Tests were made to determine the most favorable polishing conditions. (M21, Q29)

23M. The Tin-Oxygen System. (In German.) *Zeitschrift für Metallkunde*, v. 40, Oct. 1949, p. 374-376.

Study shows that SnO decomposes, when heated above 400° C., into solid Sn₂O₃ and molten tin. From a quantitative point of view, the Sn-O constitution diagram is still in approximate form. Several observations on the reduction of SnO₂ with carbon. (M24, Sn)

24M. The Manganese-Chromium System. (In German.) Ulrich Zwicker. *Zeitschrift für Metallkunde*, v. 40, Oct. 1949, p. 377-378.

Constitution diagram on the basis of thermal, metallographic, and X-ray studies. Properties and structures of alloys made of electrolytic Cr and of commercially pure Cr were found to be the same. (M24, Mn, Cr)

25M. The Phase Diagram of the Cobalt-Germanium System. (In German.) Hermann Phisterer and Konrad Schubert. *Zeitschrift für Metallkunde*, v. 40, Oct. 1949, p. 378-383.

Determined on the basis of thermal, microscopic, and X-ray analysis. It includes the four intermetallic phases of Co₂Ge, CoGe, Co₃Ge₂, and CoGe₂. 10 ref. (M24, Co, Ge)

26M. The Crystal Structure of the High-Temperature Phase of the Copper-Zinc System. (In German.) Konrad Schubert and Erich Wall. *Zeitschrift für Metallkunde*, v. 40, Oct. 1949, p. 383-385.

Investigation of the β phase was preceded by a study of the effect of temperature on the lattice constants of the γ and ϵ phases. 14 ref. (M24, Cu, Zn)

27M. Precision Measurement of Constant Crystalline Lattices. (In Russian.) A. Z. Zhmudskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1055-1061.

Method and apparatus. Satisfactory results were obtained for Fe and Al, indicating that the method is accurate within $2 \times 10^{-5}\%$. Applicability to the cubic system, to determination of linear coefficient of thermal expansion, and to study of processes connected with small changes of unit-cell dimensions. (M26)

28M. Determination of Orientation of Coarse Monocrystals. (In Russian.) Yu. A. Bagaryatskii and E. V. Kolontsova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1062-1071.

Photographic technique known as "reverse exposure". (M26, M23)

29M. Evaluation of the Grain Structure of Metals. (In Russian.) S. A. Saltykov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1114-1126.

Indicates shortcomings of ASTM scale and proposes a new approach for evaluation of grain structure of metals, particularly steel. 28 ref. (M27)

30M. Quantitative Microstructural Analysis. (In Russian.) M. E. Blanter. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1126-1127.

Further data and defense of method previously described. (M21)

31M. Crystal Structure of In₂Bi. (In Russian.) E. S. Makarov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 21, 1949, p. 509-510.

Investigated by an X-ray method. Crystallographic constants are indicated and compared with those theoretically calculated. (M26, In, Bi)

32M. Electron-Microscopic Investigation of the Structures of Gold Films Formed on the Surfaces of Aqueous Solutions of Metallic Salts by Action of Gaseous Reducing Agents. (In Russian.) N. V. Demenev, N. N. Br'nov, and M. I. Milyutina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Oct. 1, 1949, p. 721-723.

(M21, N14, Au)

33M. Investigation of Dispersion of Electrons and Electronographic Study of Structure of Crystals and High Polymers. (In Russian.) Z. G. Pinsker. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya* (Bulletin of the Academy of Sciences of the USSR, Physical Series), v. 13, July-Aug. 1949, p. 473-485.

Diffraction patterns of various metals and alloys are compared and interpreted. Results indicate wide possibilities of this method of investigation in crystallography, physical chemistry, and metallurgy. 16 ref. (M22)

34M. Polishing Metallographic Specimens With Diamond Dust. H. J. Grenville-Wells. *Industrial Diamond Review*, new ser., v. 9, Dec. 1949, p. 360-363.

Polishing of sintered carbides and polishing of relatively soft metals. Appendix on polishing of mineralogical specimens with diamond dust. 12 ref. (M21)

35M. Characteristics of Metallographic Polishing Powders. E. C. Rollason, E. Sharratt, and R. R. Roberts. *Industrial Diamond Review*, new ser., v. 9, Dec. 1949, p. 364-365. A condensation. Previously abstracted from *Journal of the Iron and Steel Institute*. See item 11-342, 1949. (M21)

36M. Surface Form of Metal Crystals; Determination by the Electron Diffraction Method. D. W. Pashley. *Metal Industry*, v. 75, Dec. 30, 1949, p. 557-560.

Details of above method, including typical results. (M22, M26)

TRANSFORMATIONS AND RESULTING STRUCTURES

1N. The Influence of Atomic Order on Magnetic Properties. J. E. Goldman. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1131-1136.

Reviews recent data on effect on magnetic properties of the order-disorder transformation. Extends recently developed theory of the influence of order on the saturation moment to cases such as Ni₂Mn and the Heusler alloy. Presents a new approach in interpreting structure-sensitive magnetic properties, notably permeability and coercive force, based on some of the consequences of order-disorder transformations. 21 ref. (N10, P16)

2N. Fundamentals of the Working of Metals. Part VI. Effects of Phase Changes on Forming. George Sachs. *Modern Industrial Press*, v. 11, Dec. 1949, p. 6, 8, 10, 48.

Examples of precipitations and their effect; eutectoid transformations of steels; phase changes and fibering; phase changes in Fe-Ni-Cr alloys. (N general)

3N. Cooling of Black-Heart Malleable Iron. J. E. Rehder. *Canadian Metals and Metallurgical Industries*, v. 12, Dec. 1949, p. 20-23, 29.

See abstract of "Influence of Silicon Content on Critical Temperature Range During Slow Cooling of Black-Heart Malleable Iron", *American Foundrymen's Society*, Preprint; item 18B-75, 1949. (N8, J23, CI)

4N. Overheating Phenomena in Aluminium-Copper-Magnesium-Silicon Alloys of the Duralumin Type. J. Crowther. *Journal of the Institute of Metals*, v. 76, Nov. 1949, p. 201-236.

The incidence of quench-cracking in components made from the above sheet to an aircraft specification led to an examination of the dependence on chemical composition of the effective solidus temperature of alloys of this general type. A series of experimental alloys covering a wide range of Si and Mg contents was investigated. The Al corner of the quaternary Al-Cu-Mg-Si system was examined at 4% Cu content, and the solidus was found to correspond closely with that of the more complex alloys. 23 ref. (N12, M24, Al)

5N. Undercooling of Minor Liquid Phases in Binary Alloys. Chih-Chung Wang and Cyril Stanley Smith. *Journal of Metals; Transactions of the*

American Institute of Mining and Metallurgical Engineers, v. 188, Jan. 1950, p. 138-139.

Tin in an Al-Sn alloy containing 10% Sn solidifies over a temperature range as high as 100°C. The tin is partly distributed in isolated droplets and the amount of undercooling depends on the chance presence of nuclei effective at various temperatures in drops of varying sizes. Heat treatment affects the size distribution and modifies the cooling curve. Similar behavior is to be expected in any alloy where the liquid is physically discontinuous and where solidification is not nucleated by a previously solidified constituent. (N12, Al, Sn)

6N. Aging Behavior of a Zinc Alloy Containing 25% Manganese, 15% Copper, 0.1% Aluminum. P. W. Ramsey and G. L. Werley. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 139-143.

Aging changes in an experimental die casting alloy from 60 to 185°C. The exponential increase of aging rate with temperature is used in predicting lower-temperature behavior, and an analogy between aging and diffusion behavior is noted. Q values derived from aging-rate curves show some agreement. (N7, Zn)

7N. Self-Diffusion in Alpha and Gamma Iron. C. E. Birchenall and R. F. Mehl. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 144-149.

Self-diffusion coefficients were measured from 720 to 1357°C. Approximate exponential laws for their behavior. (N1, Fe)

8N. The Effects of Nitrogen, Iron, or Nickel Upon the Alpha-Beta Transformation and Gamma Precipitation in Cobalt-Chromium Alloys. A. R. Elsea and C. C. McBride. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 154-161.

A metallographic investigation of the transformation and precipitation reactions occurring in the Co-rich region. All the above additions lower the α - β transformation temperature range and tend to promote formation of γ -phase. (N7, Co)

9N. The Growth of Austenite as Related to Prior Structure. A. E. Nehrenberg. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 162-174.

New austenite is restricted in growth by grain boundaries in the prior structure. It is equiaxed when the prior structure is the result of a high-temperature transformation, and is acicular in shape when the initial structure is bainite or martensite. 35 ref. (N8)

10N. Report on Graphitization Studies on High-Temperature Welded Piping of the Philadelphia Electric Company. J. B. Abele and A. E. White. *Transactions of the American Society of Mechanical Engineers*, v. 72, Jan. 1950, p. 37-46; discussion, p. 46-52.

Previously abstracted from *American Society of Mechanical Engineers*, Paper No. 48-A-94, 1948. See item 18B-54, 1949. (N8, K general)

11N. The Role of Crystal Boundaries in Anomalies of Propagation of Ultrasounds in Metals. (In French.) Jacques Bleton, Paul Bastien, and Emmanuel de Kersersau. *Comptes Rendus* (France), v. 229, Nov. 14, 1949, p. 1016-1018.

Results of experimental and theoretical investigation. (N26)

12N. Study of Recrystallization of Pure Aluminum by Means of Isochronal and Isothermal Annealing. (In French.)

H. Chossat, P. Lacombe, and G. Chaudron. *Revue de Métallurgie*, v. 46, Oct. 1949, p. 676-681.

Results indicate individual spheres of application of the two types of annealing. Isochronal annealing is particularly suited to demonstration of the influence of impurities on rate of recrystallization. Isothermal treatment at a sufficiently low temperature permits separation on a time scale of the processes of restoration and recrystallization. 10 ref. (N5, J23, A1)

13N. Graphitization of Pretempered White Cast Iron. (In French.) P. Laureat and M. Ferry. *Revue de Métallurgie*, v. 46, Oct. 1949, p. 695-698.

Results of comprehensive study indicate that initial formation of graphite takes place, not in the eutectic cementite, but in the cementite of the sorbite. Thus, to obtain rapid graphitization, it is necessary to have a sorbitic structure. (N8, C1)

14N. The Martensite Transformation. (In Czech.) Vojtěcha Jareš. *Hutnické Listy*, v. 4, Oct. 1949, p. 309-316.

Reviews present knowledge and methods for determination of the M point. Gives particular attention to a method using the unnotched impact test. A small specimen is broken at the quenching temperature. At the M point there is a sudden decrease in toughness with decreasing temperatures. (N8)

15N. Contribution to the Theory of Segregation. (In German.) H. Klemm. *Archiv für Metallkunde*, v. 3, Nov. 1949, p. 376-380.

Attempts to explain segregation processes, especially from the unstable state, on the basis of precipitation theory. Distinguishes between the cooling segregate and the annealing segregate. Processes are expressed in the form of formulas. 14 ref. (N7)

16N. Changes in Volume During Formation of Solid Solutions of Metallic Alloys. (In Russian.) N. Kh. Abrikosov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 21, 1949, p. 511-514.

The problem was studied using solid solutions of Cu, Ag, and Au with metals of the 4th and 5th groups of the periodic system. Method of investigation and data for each investigated alloy. 26 ref. (N12)

17N. Study of Transformation in the α -Solid Solution in the System Fe-Cr by a Rate-of-Transformation Method. (In Russian.) I. I. Kornilov and V. S. Mikheev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 21, 1949, p. 527-530.

Use of newly developed technique to determine the complex character of the above transformation. Maximum rate was found for alloys containing 42.4, 46.44, and 49.5% Cr. Indicates formation of β and θ phases, as well as the previously known σ phase. (N8, Fe, Cr)

18N. Rates of Processes in the Thermochemical Treatment of Steel. (In Russian.) M. M. Zamyatin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 21, 1949, p. 545-548.

Apparently refers to such processes as chromizing, nitriding, etc., where diffusion is an important factor. Theoretical analysis. Equations are graphically interpreted for different values of the variables. (N1, L15, J28, ST)

19N. Causes of the Influence of Molybdenum on Kinetics of Isothermal

Decomposition of Austenite. (In Russian.) B. Yu. Mett and P. I. Entin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Oct. 1, 1949, p. 681-684.

Investigated for low-alloy steel (0.68% C, 0.24% Si, 0.49% Mn, and 0.65% Mo) by determining the structure of the carbide phase in the initial phase of austenite decomposition. In steel containing about 7% Mo, the beginning of the process is connected, in the temperature range of the pearlite transformation, with formation of a molybdenum carbide. On the contrary, below 5% the decomposition is not connected with diffusion of Mo; therefore, the latter does not have any important influence on the rate of decomposition. (N8, AY)

20N. Influence of Size and Shape of Parts or Test Specimens on Depth and Composition of Layers Resulting from Thermochemical Treatment of Steel. (In Russian.) M. M. Zamyatin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Oct. 1, 1949, p. 725-728.

Apparently refers to such processes as chromizing or nitriding. Theoretical analysis of the effects of above factors, also of time, temperature, and composition. (N1, L15, J28, ST)

21N. The Problem of Spontaneous Formation of Nuclei of a New Phase. (In Russian.) O. S. Ivanov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Oct. 1, 1949, p. 729-732.

Proposes an improved formula for determination of the rate of nuclei formation, with particular reference to phase transformation in substances such as metals and alloys. (N2)

22N. Calculation of the Rate of Solidification of Metallic Bodies. (In Russian.) B. Ya. Lyubov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., Oct. 11, 1949, p. 847-850.

A mathematical analysis. (N12)

23N. Concerning Anomalous Effects in X-Ray Diffraction Patterns of Aging Polycrystalline Alloys. (In Russian.) A. M. Elistratov, S. D. Finkel'shtein, and A. I. Pashilov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., Oct. 21, 1949, p. 1017-1020.

Several coarse-grained polycrystalline alloys subject to aging were studied; namely, several Al alloys and beryllium bronze. X-ray diffraction patterns of such alloys are very sensitive to structural changes accompanying aging. Possibility of explaining the mechanism of aging by study of these patterns. (N7, M22, Al, Cu)

24N. Electron Microscope Study of Aging of Aluminum-Magnesium-Silicon Alloys. (In French.) Raymond Castaing and André Guinier. *Comptes Rendus (France)*, v. 229, Nov. 28, 1949, p. 1146-1148.

Study of three main types of aging: below 200°C, between 200 and 250°C, and at higher temperatures. Confirms the linear character of structural changes in the initial stage. (N7, M22, Al)

25N. Concerning Changes in Grain Size of Steel as a Result of Its Recrystallization. (In Russian.) V. I. Arkharov and Yu. D. Kozmanov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Nov. 1, 1949, p. 33-35.

Volumetric changes taking place upon heating above 1000°C result in a transition state prior to re-

crystallization called "transcrystallization" characterized by overlapping of the crystallites. The distortion of the crystal lattice caused by this transition step is followed by recrystallization of the product of the phase transformation. Depending on the degree of crystallite overlapping, which varies with composition, rate of "transcrystallization," and conditions of subsequent heat treatment, the second step—recrystallization—may result in quite wide differences in final grain size. (N5, ST)

PHYSICAL PROPERTIES AND TEST METHODS

1P. Volume Changes in the Plastic Stages of Simple Compression. P. W. Bridgman. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1241-1251.

Method by which volume changes occurring during plastic flow in simple compression are directly measured in a dilatometer during the flow process. Advantage of the method over indirect determination from alteration of dimensions is pointed out. Results were obtained for three rocks, quartz crystal, and a number of metals including several grades of steel and iron. (P10, Q23)

2P. The Physical Properties of Titanium. I. Emissivity and Resistivity of the Commercial Metal. Walter C. Michels and Sally Wilford. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1223-1226.

Measured from room temperature to 1400°K. Spectral emissivity and brightness temperature scale were also determined from 1000 to 1400°K. 11 ref. (P17, P15, T1)

3P. Structure and Properties of the Permanent Magnet Alloys. Alfred H. Geisler. *Electrical Engineering*, v. 69, Jan. 1950, p. 37-44.

Some structural factors which facilitate an understanding of the effects of composition and heat treatment on the properties of permanent magnet materials. Reactions in solid solutions; properties of solid solutions and mixed phases; eutectoid decomposition; precipitation from solid solution; superlattice formation; origin of permanent magnetism; and magnetic anisotropy. (P16, N general, SG-n)

4P. Vapor Pressure of Titanium. John M. Blocher, Jr., and I. E. Campbell. *Journal of the American Chemical Society*, v. 71, Dec. 1949, p. 4040-4042.

Determined from 1500-1800°K. using the Langmuir technique. The data are used for thermodynamic calculations and compared with results of Carpenter and Reavell. 11 ref. (P12, T1)

5P. Chart Simplifies Recording of Wire Resistance Data. Joseph T. Hogan. *Chemical Engineering*, v. 56, Dec. 1949, p. 113-114.

Chart gives resistance in ohms per ft. for 17 metals and alloys for wire sizes ranging from Nos. 5-40 B. & S. gage. (P15)

6P. Magnetic Saturation Intensities and Curie Temperatures for Some Industrial Permanent Magnet Materials. L. Ward. *Metallurgia*, v. 41, Nov. 1946, p. 3-7.

The work was undertaken in order to investigate the phase conditions by magnetic analysis of a representative selection of commercial magnetic materials. The investigation has indicated that, in alloys of the Alnico-type, there is a reversible

phase up to the Curie point, and that the cobalt steels, as industrially heat treated, contain mixtures of austenitic and magnetic alpha phases. (P16, N8, SG-n)

7P. Some Physical Properties of Aluminum Alloys at Elevated Temperatures. *Metallurgia*, v. 41, Nov. 1949, p. 15-21.

Experimental results for the thermal conductivities, electrical resistivities, and coefficients of linear thermal expansion of nine wrought and ten cast Al alloys, mainly over the range 20-300° C., but in a few instances at higher temperatures. Some of the alloys were given special heat treatments at about 160° C. before testing. Except for a few high-Si alloys, results can be expressed within about 5% by an empirical equation containing the above factors. (P11, P15, Al)

8P. Electrical Resistivity and Thermoelectric Power of Antimony-Selenium Alloy. B. D. Cullity, M. Telkes, and John T. Norton. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 47-52.

The research was initiated in an attempt to find a material for use in thermo-electric generators. Although none of the Sb-Se alloys is suitable for this purpose, the properties of Sb₂Se₃ indicate that it may have applications as a thermistor material. 19 ref. (P15, Sb, SG-q)

9P. Reactions of Zirconium, Titanium, Columbium, and Tantalum With the Gases, Oxygen, Nitrogen, and Hydrogen at Elevated Temperatures. Earl A. Gulbransen and Kenneth F. Andrew. *Journal of the Electrochemical Society*, v. 96, Dec. 1949, p. 364-376.

A systematic study of the kinetics of the above reactions. Data are correlated with fundamental diffusion and solution processes. 36 ref. (P 13, N15, EG-d, EG-m)

10P. Unsymmetrical Hysteresis Loops in a Nickel-Iron Alloy. J. L. Rothery and An Wang. *Nature*, v. 164, Dec. 10, 1949, p. 1004-1005.

Pronounced asymmetry was observed in the dynamic hysteresis loop of one particular sample (a 47-50 Ni-Fe alloy containing 1% Al in the form of a wound-tape strip). The effect was found to a lesser extent in similar Ni-Fe alloys, but not in the usual soft magnetic alloys. (P16, Ni, Fe)

11P. Electronic Specific Heats in Tungsten and Zinc. A. A. Silvili and J. G. Daunt. *Physical Review*, ser. 2, v. 77, Jan. 1, 1950, p. 125-129.

Calorimetric measurements were made in the liquid-helium temperature region. Results were resolved into lattice T³ functions and electronic terms. 36 ref. (P12, W, Zn)

12P. An Experimental Investigation of the Electrical Performance of Bolted Aluminum-to-Copper Connections. W. F. Bonwitt. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part II, 1948, p. 1208-1218; discussion, p. 1218-1219.

The feasibility of making direct connections between Al and Cu. Suitable finish for Cu. Effect of using a compound in such connections. (P15, T1, Al, Cu)

13P. Bridge Erosion in Electrical Contacts and Its Prevention. W. G. Pfann. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part II, 1948, p. 1528-1533.

Previously abstracted from condensed version in *Electrical Engineering*. See item 3C-34, 1949. (P15, R1)

14P. The Magnetic Properties of Stainless Steels. William A. Stein. *Transactions of the American Institute*

of Electrical Engineers, v. 67, Part II, 1948, p. 1534-1537.

Previously abstracted from condensed version in *Electrical Engineering*. See item 3B-41, 1949. (P16, SS)

15P. Hy-Therm Copper—An Improved Overhead-Line Conductor. L. F. Hickernell, A. A. Jones, and C. J. Snyder. *Transactions of the American Institute of Electrical Engineers*, v. 68, 1949, p. 22-27; discussion, p. 27-30.

Previously abstracted from *Electrical Engineering*. See item 18C-5, 1949. (P15, SG-r, Cu)

16P. Thermo-Electric and Thermo-dynamic Study of Aluminum Alloys Containing Mg, Si, Fe, and Ti as Alloying Elements. (In French.) C. Crusard and F. Aubertin. *Revue de Métallurgie*, v. 46, Oct. 1949, p. 661-675.

Comprehensive study with emphasis on thermo-electric effects. Such effects are usually proportional to concentration of the alloying element. Anomalies observed in the case of Mg are explained. 12 ref. (P15, P12, Al)

17P. Generalized Mechanism of Coercive Field and of Residual Magnetism of MnBi Powder. (In French.) Charles Guillaud. *Comptes Rendus (France)*, v. 229, Nov. 14, 1949, p. 992-993.

On the basis of obtained data and theoretical considerations, it is shown that the above mechanism is the same as for other ferromagnetic bodies belonging to the hexagonal system for which the axes of easy magnetization are their directional axes. (P16)

18P. Concerning the Variation of the Extrapolated Moment μ_{0-0} of Ferromagnetic Alloys of the Iron Group. (In French.) Pierre Taglang. *Comptes Rendus (France)*, v. 229, Nov. 14, 1949, p. 994-995.

The relationship between the above moment and the Curie point was investigated. It was found to be independent of Curie point. (P16, SG-n)

19P. Contacts Used in Electrical Measuring Technique. (In German.) Hansjorg Machk. *Archiv für Technisches Messen*, Nov. 1949, p. T102-T104 (6 p.).

The various types of contact used; sources of error (such as contact resistance, voltage, and temperature as well as mechanical disturbances); the proper care of contacts; properties and uses of different contact materials; and special characteristics of different types of contact. 21 ref. (P15, SG-r)

20P. The Reflection and Absorbing Power of the Metals. (Theoretical Remarks on the Measurements of K. Weiss.) (In German.) Eckhart Vogt. *Annalen der Physik*, ser. 6, v. 3, Aug. 1, 1948, p. 82-88.

Critical analysis of Weiss measurements (recent German work) on the absorbing powers of "manganin", copper, and iron for infrared rays. The absorbing power of copper agrees with Drude's metal-electron theory, whereas that of manganin agrees with Hagen-Rubens's theory. In the case of Fe, the steep rise of absorption with decreasing wave length indicates electron transfer of the conduction electrons from the incompletely occupied d-band to the s-band. 16 ref. (P17)

21P. Electrical Properties of Ruthenium. (In German.) E. Justl. *Zeitschrift für Naturforschung*, v. 4a, Sept. 1949, p. 472-474.

Electrical resistances and Hall effects of Ru (99.99% purity) were determined at temperatures ranging from the boiling point of hydrogen to the freezing point of water. 10 ref. (P15, Ru)

22P. Study of Transformations in Austenitic Alloys by a Magnetic Method. (In Russian.) G. V. Estulin. *Zavodskaya Laboratoriya (Factory Laboratory)*, v. 15, Oct. 1949, p. 1262-1263.

Method of measuring magnetic properties of certain austenitic steels—Cr-Ni and Cr-Mn-W. (P16, N8, AY)

23P. Investigation of a Cr-Te Alloy. (In Russian.) A. K. Kikoin. *Doklady Akademii Nauk SSSR (Reports of the Academy of Sciences of the USSR)*, new ser., v. 68, Sept. 21, 1949, p. 481-482.

Heat capacity and temperature variation of resistance of an alloy containing 24.3% Cr and 75.7% Te. Method of production of the test specimen and its investigation. A marked anomaly in the heat capacity at 60° C. (P12, 15, Cr, Te)

24P. Electroconductivity of the Ferromagnetic Cr-Te Alloy. (In Russian.) I. G. Fakidov, N. P. Grazhdankina, and A. K. Kikoin. *Doklady Akademii Nauk SSSR (Reports of the Academy of Sciences of the USSR)*, new ser., v. 68, Sept. 21, 1949, p. 491-492.

Investigation of temperature dependence of specific resistance of Cr-Te alloys close to the stoichiometric composition, CrTe; and of influence of magnetic field on resistance. Method of investigation, including technique of alloy preparation. (P15, P16, Cr, Te)

25P. Causes of Passivity of Copper and Iron in the Benzene Hydrogenation Reaction. (In Russian.) M. Ya. Kagan and S. D. Fridman. *Doklady Akademii Nauk SSSR (Reports of the Academy of Sciences of the USSR)*, new ser., v. 68, Oct. 1, 1949, p. 697-699.

Benzene is not hydrogenated in the presence of Cu and Fe catalysts. Experiments indicate the reason for this behavior, which is in contrast to that of Pt, Pd, and Ni. (P13, Cu, Fe)

26P. Physical Properties of Polonium. I. Melting Point, Electrical Resistance, Density, and Allotropy. Charles R. Maxwell. II. X-Ray Studies and Crystal Structure. William H. Beamer and Charles R. Maxwell. III. The Half-Life of Polonium. William H. Beamer and William E. Easton. *Journal of Chemical Physics*, v. 17, Dec. 1949, p. 1288-1300.

Part I: Properties and preparation technique. Part II: Technique, atomic-diameter data and information on the Po-Pb alloy system. 22 ref. (P general, M general, Po)

27P. Reactivity of Different Faces of a Copper Single Crystal. P. R. Rowland. *Nature*, v. 164, Dec. 24, 1949, p. 1091-1092.

By using single-crystal metal spheres, Hausser, Tamman, and Satorius, and A. T. Gwathmey and collaborators, have demonstrated marked differences in the physicochemical properties of crystal surfaces of a crystal. Their techniques were extended to reactions in which crystals are etched by vapors under conditions of temperature and pressure such that the product is volatilized away as fast as it is formed. Etch pits produced were examined. Potentialities of the technique. (P13, Cu)

28P. Emissivities of Copper and Aluminum. George Best. *Journal of the Optical Society*, v. 39, Dec. 1949, p. 1009-1011.

Total hemispherical emissivities of Cu and Al were determined from 100 to 400° C. Comparison of the results with those predicted by the theory of Davison and Weeks shows moderate agreement for Al and disagreement for Cu. (P17, Cu, Al)

29P. Hydrophobic Monolayers Adsorbed From Aqueous Solutions. Elaine G. Shafrin and W. A. Zisman. *Journal*

of *Colloid Science*, v. 4, Dec. 1949, p. 571-590.

Results of studies on several members of a homologous family of primary amines of the normal alkyl type adsorbed onto platinum surfaces. The method is proposed as a possible approach to the examination of films important in the fields of selective adsorption, mineral flotation, corrosion inhibition, and pickling of metals. 14 ref. (P13)

30P. Ferromagnetic Properties of a Cobalt Monocrystal. (In French.) Charles Guillaud and Madeleine Roux. *Comptes Rendus (France)*, v. 229, Nov. 21, 1949, p. 1062-1064.

Curves of magnetization were investigated as a function of internal field at constant temperature; and magnetization at constant field as a function of temperature; also magnetocrystalline energy. (P16, Co)

31P. Macroscopic Magnetic Structure of Permalloy Strips. (In French.) Israel Epelboin and André Marais. *Comptes Rendus (France)*, v. 229, Nov. 28, 1949, p. 1131-1133.

Distribution of magnetic permeability according to distance from the surface of solid ferromagnetics and definite relations between this distribution and metal thickness in case of complex ferronickels of the permalloy type (77% Ni, 14% Fe, 5% Cu, 4% Mo), differently heat treated, were investigated. (P16, M28, SG-n)

32P. Investigation of Paramagnetic Susceptibility of Alloys of Transition-Group Metals With Tellurium. (In Russian.) F. M. Gel'perin and T. M. Perekalina. *Doklady Akademii Nauk SSSR (Reports of the Academy of Sciences of the USSR)*, new ser., v. 69, Nov. 1, 1949, p. 19-22.

Alloys of V, Cr, Co, and Ni with Te were investigated using the apparatus described by Sucksmith and Pearce, crystal structure being determined by an X-ray method. Physical constants and paramagnetic susceptibilities. (P16, Te)

33P. Investigation of Electrocapillary Phenomena for Alloys of Tin With Gold and of Bismuth With Tellurium. (In Russian.) S. Karpachev and E. Rodigina. *Zhurnal Fizicheskoi Khimii (Journal of Physical Chemistry)*, v. 23, Aug. 1949, p. 953-958.

Investigated for liquid alloys. Sharp minima of surface tension were observed in both alloys. Conditions of existence of maxima and minima of surface tension were analyzed theoretically for interfaces of a bimetallic alloy and its saturated vapor. (P10, Sn, EG-a)

34P. A Kinetic Method of Physico-chemical Analysis. II. Kinetics of Catalytic Dissociation of Hydrogen Peroxide on Alloys. (In Russian.) V. A. Shushunov and K. G. Fedyakova. *Zhurnal Fizicheskoi Khimii (Journal of Physical Chemistry)*, v. 23, Aug. 1949, p. 936-941.

The relation between catalytic activity of certain binary alloys and their composition was investigated. Dissociation of H_2O_2 under catalytic action of pure Bi, Cd, Sb, and Sn and their alloys obeys the law of monomolecular reaction. Energy of activation of dissociation of H_2O_2 on Bi + Sn alloys decreases in a linear manner with increase of concentration of Sn. (P13, Sn, EG-a)

35P. Influence of Tensile Stressing on Magnetic Saturation of Fe-Ni Alloys in the Invar Region. (In Russian.) K. P. Belov. *Zhurnal Tekhnicheskoi Fiziki (Journal of Technical Physics)*, v. 19, Sept. 1949, p. 1032-1040.

Change of magnetic saturation of alloys close to invar (36% Ni, 64% Fe) in composition and properties was investigated. 18 ref. (P16, SG-s)

36P. Thermal Expansion Near the Melting Point. G. M. Bartenev. *Zhurnal Fizicheskoi Khimii (Journal of Physical Chemistry)*, v. 23, Sept. 1949, p. 1075-1082.

Theoretical considerations, and a relationship describing approximately the curve of thermal expansion near the melting point. Comparison of theoretical and experimental data indicates, particularly for Zn and Bi, satisfactory agreement. Numerical values of "melting quanta" are determined for Bi, Cd, Zn, and Hg. (P11, Zn, EG-a)

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

1Q. Note on the Role of Rifting in Cold Work and a Possible Measure of Plastic Deformation. Donald P. Smith. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1186-1187.

It is believed that plastic deformation of crystalline metallic bodies is accompanied by opening of lattice structure. Various such evidences of "rifting" afforded by the behavior of metals with hydrogen. Some probable connections between rifting and deformation. (Q24)

2Q. Grain Boundary Relaxation and the Mechanism of Embrittlement of Copper by Bismuth. T'ing-Sui Ke. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1226-1231.

Voce and Hallows proposed recently that the agent responsible for embrittlement is Bi in the form of thin films at grain boundaries. Internal-friction and elastic-modulus measurements were made on Cu specimens free from and containing Bi up to 0.01% with a frequency of transverse vibration of about 1000 cycles per sec. from -50 to 550°C . Effect of cold work, heat treatment, and rate of cooling were also studied. Results support Voce and Hallows' theory. However, it appears that the Bi is distributed in a highly heterogeneous manner. (Q23, Q22, Cu)

3Q. X-Ray Diffraction Line Broadening and Strain Hardening. D. Rosenthal. *Journal of Applied Physics*, v. 20, Dec. 1949, p. 1257.

Arguments indicating that broadening is indicative of heterogeneity of strain hardening, rather than of strain hardening itself. (Q24, M22)

4Q. Stress Analysis by X-Ray Diffraction. C. R. Lewis. *Non-Destructive Testing*, v. 8, Fall 1949, p. 18-22.

Mathematical basis and methods used by Chrysler Corp. (Q25)

5Q. New Photo-Grid Method for Sheet Studies. *Aviation Week*, v. 51, Dec. 26, 1949, p. 17-18.

New procedure developed at National Bureau of Standards which gives greater accuracy in judging effects of forming action on high-strength Al alloy. (Q25, Al)

6Q. Plastic Strain and Hysteresis in Drawn Steel Wire. R. S. Brown. *Wire Industry*, v. 16, Nov. 1949, p. 897-899, 901-902; Dec. 1949, p. 981-983, 985-986. Previously abstracted from *Journal of the Iron and Steel Institute*. See item 19B-117, 1949. (Q24, ST)

7Q. The Economic Value of Increase of Modulus of Elasticity in Aluminium Alloys. H. L. Cox and M. J. Windle. *Aircraft Engineering*, v. 21, Dec. 1949, p. 382-383.

Compares normal Al alloys and alloys with increased values of modulus of elasticity for covering the upper surfaces of wings of moderately thick sections, particularly of

the smooth-wing type. Comparison is intended to form the basis for design of test panels for experimental verification of the theoretical conclusions. (Q21, T24, Al)

8Q. On the Theory of Strength of Quasi-Isotropic Solids. R. Furth. *Philosophical Magazine*, ser. 7, v. 40, Dec. 1949, p. 1227-1233.

Shows that Bragg's theory of the strength of metals, which is based on the assumption of a block structure of the crystallites; and the author's thermodynamic theory of strength, which is based on the idea of a relationship between breaking and melting; can be related to each other if it is assumed that block structure is an intrinsic feature of the crystal lattice. Some implications of the concept of an "intrinsic block structure" of crystal lattices are discussed. 24 ref. (Q23, M26)

9Q. The Mechanism of Deformation in Metals, With Special Reference to Creep. W. A. Wood and W. A. Rachinger. *Journal of the Institute of Metals*, v. 76, Nov. 1949, p. 237-253.

A study was made of changes in crystalline structure produced at various temperatures when a metal was subjected to the slow rate of strain typical of creep process and also to the relatively rapid rate associated with ordinary mechanical testing. Measurements were also made at the same time of strength under various conditions of deformation. The object was to investigate the relation of deformation by creep to that by slip. Results show that the grains develop a sub-structure of a size determined by temperature and rate of strain. The mechanism of deformation changes from slip to creep as the elements of the sub-structure exceed a certain size. (Q24, Q3)

10Q. Compression Creep Testing. A. H. Sully. *Metal Industry*, v. 75, Dec. 9, 1949, p. 491-492.

New type of apparatus designed for stresses up to 10 tons per sq. in. and temperatures up to at least 1000°C . Typical results. (Q3)

11Q. Wire Strain Gauges: Applications to Tensile, Compression and Fatigue Testing. R. T. Budd and R. J. Parker. *Metal Industry*, v. 75, Dec. 16, 1949, p. 511-514, 521.

Procedures and equipment. (Q25)

12Q. Measurement of Surface Strains in Diaphragms. B. C. Carter, J. C. Ghosh, M. V. C. Sastri, and K. V. Chinnappa. *Engineering*, v. 168, Dec. 2, 1949, p. 581-583.

When metal diaphragms are used in pressure gages, central deflection of the plate is usually measured. However, this method has poor accuracy at high pressures. Recommends use of measurements of surface strains as pressure indicators. Results of experiments designed to determine suitability of such measurements, using resistance-wire strain gages, for indication of pressures. Data for pressures up to 1300 psi. are tabulated and graphed. (Q25)

13Q. Effect of Solute Elements on the Tensile Deformation of Copper. Roland Sydney French and Walter R. Hibbard, Jr. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 53-58.

True stress-true strain data for Cu and Cu alpha-solid-solution alloys indicate that strain-hardening coefficient is a function of yield strength but independent of solute element added. Approximately linear relationships were found between yield strength and atomic per cent solute. (Q27, Cu)

14Q. Textures in Cold Rolled Copper and 70-30 Alpha Brass. Walter R. Hibbard, Jr. *Journal of Metals; Transactions of the American Institute of*

Mining and Metallurgical Engineers, v. 186, Jan. 1950, p. 122.

At 99.993% reduction in thickness point the materials failed completely. No attainable amount of cold rolling will cause the pole figures of cold rolled copper and 70-30 brass to become similar, in spite of the fact that such similarity is predicted by theory. (Q24, F23, Cu)

15Q. Plastic Deformation in the Rolling Process. B. L. Averbach. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 150-153.

Distribution of principal strains within a bar after a 20% rolling reduction was determined by radiographing a lead grid embedded in a cast-tin bar. Axial and vertical principal strains of about the same magnitude and direction as those reported by others at the surface of a bar were observed in the interior. The principal lateral strain, however, changed from tension at the center of the bar to compression midway between the center and the outside in a section perpendicular to the roll axis. (Q24)

16Q. The Elastic Coefficients of Single Crystals of Alpha Brass. Raymond W. Fenn, Jr., Walter R. Hibbard, Jr., and Henry A. Lepper, Jr. *Journal of Metals; Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 188, Jan. 1950, p. 175-181.

Results of static tension and torsion tests. 18 ref. (Q21, Cu)

17Q. Fatigue Tests on Flanged Assemblies. A. R. C. Markl and H. H. George. *Transactions of the American Society of Mechanical Engineers*, v. 72, Jan. 1950, p. 77-84; discussion, p. 84-87.

Stress-intensification factors obtained from fatigue tests of full-scale assemblies of 4-in. flanges of the 300-lb. ASA pressure class, and hence directly applicable to piping flexibility calculations. (Q7)

18Q. Elastic Equilibrium in the Presence of Permanent Set. G. Colonnetti. *Quarterly of Applied Mathematics*, v. 7, Jan. 1950, p. 353-362.

Fundamental and general consideration, with a minimum of mathematics. (Q21)

19Q. Some Implications of Work Hardening and Ideal Plasticity. D. C. Drucker. *Quarterly of Applied Mathematics*, v. 7, Jan. 1950, p. 411-418.

Points out the severe restriction imposed on possible stress-strain relations by a mathematical formulation of the concepts of work hardening and ideal plasticity. Using this condition, an algebraic derivation and extension of Prager's extension of the Mises plastic-potential function is presented. The meaning of stability of plastic deformation as contrasted with stability of non-conservative systems in general. (Q24)

20Q. The Present State of Development of Experimental Stress Analysis. M. Hetenyi. "Proceedings of the Seventh International Congress for Applied Mechanics", Introduction, 1948, p. 57-74.

Illustrates the type of information that can be derived from examination of fracture surfaces by using a few examples. The advancement of electrical instrumentation and interferometry. Applications of stress analysis in medical research and other fields. 17 ref. (Q25)

21Q. A New Theory of Elasticity and Strength. Henry Brandenberger. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 14-27.

A mathematical analysis. (Q21)

22Q. Concerning the Principle of Saint-Venant. (In French.) Kerim

Erim. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 28-32.

A critical interpretation of the above principle, which is an important proposition in the theory of elasticity. Cases where it cannot be applied. (Q21)

23Q. Concerning the Calculation of the Deformation of an Imbedded Elastic Solid. (In French.) Mauro Picone. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 41-48.

Proposes a new theoretical method. Equations are interpreted for different values of the variables. (Q24)

24Q. Severe Deformations. K. H. Swainger. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 49-60.

Theories leading to linear equations for the analysis of finite displacements and strains with elastic, plastic, and flow components in anisotropic bodies and applied normal stress. 24 ref. (Q24)

25Q. A Theory of the Transition From Tough to Brittle Fracture With Special Reference to Velocity Effects in Impact Testing. W. Lethersich. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 61-73.

It was concluded that tough fracture is associated with low impact velocities and brittle fracture with high velocities. The relation between impact strength and velocity is deduced quantitatively but only verified qualitatively by experiment. Relation between tensile strength and rate of loading. 10 ref. (Q23, Q6)

26Q. Plane State of Stress Studied by Use of a Physical Grid. L. E. Grinther. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 139-150.

Procedures of grid analogy and strain justification were used on such problems as plate stresses due to weld shrinkage, stresses due to rectangular notches in thin beams, and gusset plate analysis. (Q25)

27Q. Experimental Investigation of the Post-Buckling Behaviour of Flat Plates Loaded in Shear and Compression. A. van der Neut. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 174-186.

(Q28)

28Q. Photoelastic Investigation of the Stress Concentration Caused by Surface Irregularities. A. F. C. Brown and V. M. Hickson. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 269-279.

(Q25)

29Q. A New Approach to the Problem of Flow. A. Graham. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 348-351.

A brief mathematical analysis. (Q24)

30Q. Opposite Tension in Adjacent Fibres at Plastic Flow. F. K. Th. van Iterson. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 352-355.

In the solid state, the three principal stresses are in general different at any spot in a strained body; in the liquid state they are equal. Applies this law to the overstraining by torsion of a solid cylindrical bar. (Q24)

31Q. The Interaction Between the Crystals of an Aggregate During Plastic Deformation. W. Boas. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 356-364.

Relation to physical and mechanical properties of metals and alloys. (Q24)

32Q. Some Special Problems of Indentation and Compression in Plasticity. R. Hill. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 365-377.

Boundary-value problems in plane plastic flow, expansion of a semi-circular hole in the surface of an infinite medium, and compression of a wedge by a flat die. (Q24)

33Q. The Determination of Static and Dynamic Yield Stresses Using a Hard Steel Ball. R. M. Davies. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 1, 1948, p. 418.

The static experiment is to find the least force which must be applied to the steel ball to produce a permanent indentation. The dynamical experiment is to find the least normal velocity of impact which gives a similar indentation. Tests were made on mild steel homogeneous armor plate and a very hard Ni-Cr steel. (Q21, ST)

34Q. Concerning a New Method of Pneumatic Amplification and Its Application in Extensometry. (In French.) H. de Leiris. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 4, 1948, p. 121-127.

Despite the complicated mechanism of apparatus using this type of amplification, the results obtained are said to warrant its use. (Q27)

35Q. An Electronic Method for the Measurement of an Electrical Quantity and Its Application to the Indication of Strain. E. H. T. Jackson. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 4, 1948, p. 128-136.

Instrument has a very large effective scale length, suitable for use with electrical resistance strain gages. Application for the measurement of static and dynamic strains. (Q25)

36Q. A Study of Fatigue Phenomena Under Combined Stress. J. A. Sauer. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 4, 1948, p. 150-164.

Investigation of an Al alloy subject to combined alternating stresses, including pure torsion, pure bending, and combinations thereof. Tests were conducted on a mechanical oscillator fatigue machine. S-N fatigue strengths at 10 cycles are plotted on a biaxial combined stress diagram. Results approximate the maximum shear theory of failure. Other fatigue tests performed under conditions of biaxial fatigue stresses. 15 ref. (Q7, Al)

37Q. The Mechanical and Optical Properties of Catalin 800 and Its Suitability as Photo-Elastic Material. C. Mulonas. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 4, 1948, p. 165-179.

Effects of the most common types of creep on stress distribution. Properties at high temperatures. A way to machine Catalin without production of stresses. 23 ref. (Q25)

38Q. The Frictional Properties of Tungsten Carbide. F. T. Barwell and A. A. Milne. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 4, 1948, p. 294-310.

Covers WC, steel, two bronzes and a white metal over an extreme range of hardness. Lubricants used were oleic acid, paraffin oil, and two common lubricating oils. (Q9, SG-m)

39Q. The British 50-Ton Dead Weight Standard of Load Installed at the National Physical Laboratory, Teddington. C. E. Phillips. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 4, 1948, p. 268-277.

Machine is capable of applying tension or compression load from 1½ to 50 tons, being accurate to about one part in 100,000. (Q27, Q28)

40Q. Use of Electrical Resistance Strain Gauges in the Continuous Measurement of Frictional Force. J. S. Weber and A. A. Milne. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 4, 1948, p. 311-323.

The apparatus. (Q25)

41Q. Strength of Metal Aircraft Elements. Rev. Ed. Subcommittee on Air Force-Navy-Civil Aircraft Design Criteria, Munitions Board Aircraft Committee, Document ANC-5a, May 1949, 109 pages.

Data for only the most commonly used materials and elements. With a few exceptions the information is acceptable to the Air Forces, Bureau of Aeronautics of the Navy, and Civil Aeronautics Administration. Methods and formulas for calculating the strength of various structural components. (Q23, T24)

42Q. Elastic Constants and Sound Velocities. III. The Elastic Constants of Uranium. Henry L. Laquer. U. S. Atomic Energy Commission, AEC-D-2606, May 26, 1949, 27 pages.

Well-defined specimens of polycrystalline uranium metal were tested by a dynamic method. Accuracy of measurements is said to be limited only by the anisotropy and relatively large size of the individual crystallites in the available specimens. 17 ref. (Q21, U)

43Q. Drawn Steel Wire; Plastic Strain and Hysteresis. R. S. Brown. *Iron and Steel*, v. 22, Dec. 1949, p. 629-632.

Previously abstracted from *Journal of the Iron and Steel Institute*. See item 19B-117, 1949. (Q24, F28)

44Q. The Seizure of Metals. F. P. Bowden and D. Tabor. *Institution of Mechanical Engineers, Proceedings*, v. 160, Dec. 1949, p. 380-383; discussion, p. 392-402.

See abstract of condensed version in *Engineer*, item 3A-98, 1949. (Q9)

45Q. The Measurement of Kinetic Boundary Friction, or the Experimental Investigation of "Oiliness". J. R. Bristow. *Institution of Mechanical Engineers, Proceedings*, v. 160, Dec. 1949, p. 384-392; discussion, p. 392-402.

Study of the nature of sliding in friction-measuring instruments, in which friction is measured by the deflection produced in an elastic system which presses one surface against another moving surface, have led to the design of an instrument which allows the variation of boundary friction with velocity to be determined at very low velocities. Suggests that curves of coefficient of boundary friction vs. velocity are the correct form in which the results of measurements of kinetic boundary friction should be stated. Results illustrate the influence of temperature, nature of the surfaces, and surface finish on kinetic boundary friction for a variety of lubricants. 14 ref. (Q9)

46Q. The Surface-Roughness of Bearing Surfaces and Its Relation to Oil Film Thickness at Breakdown. A. Cameron. *Institution of Mechanical Engineers, Proceedings*, v. 161, War Emergency Proceedings No. 48, 1949, p. 73-77; discussion, p. 77-79.

The relation of surface roughness of bearing surfaces to allowable film thickness was studied quantitatively with a simple Michell-pad apparatus. The pads were faced with white metal and run against mild-steel collars. The lubricants studied were water, soap solution, paraffin, and light oil. There is for this system a quantitative relation between total

surface roughness of the rubbing surfaces and calculated oil-film thickness both at initial metal-to-metal contact and seizure. (Q9, S15)

47Q. The Stresses in Certain Cylindrical Swept Tubes Under Torsion and Bending. J. J. Thompson and W. H. Wittrick. *Council for Scientific and Industrial Research* (Sydney, Australia). Aeronautical Research Report ACA-43, Jan. 1949, 20 pages.

A method of calculating the stress distribution in a singly symmetrical swept tube of constant trapezoidal section, with booms and stringers, under constant bending and torque. Expressions are derived for determining complete stress distribution. The stress-function solution for a doubly symmetrical rectangular tube with booms only, under an exponentially varying torque is obtained. (Q25)

48Q. Creep of Aluminum Alloys. (In French.) R. Chenigny and R. Syre. *Revue de Métallurgie*, v. 46, Oct. 1949, p. 682-686; discussion, p. 687.

A study of the fundamental characteristics. Method of investigation and data. (Q3, Al)

49Q. Study of Means of Hardness Testing of the Plastic Deformability and Cold Hardenability of Cold-Rolled Zinc. (In French.) P. Bastien and A. Popoff. *Revue de Métallurgie*, v. 46, Oct. 1949, p. 699-709.

Results of experimental and theoretical investigation, showing suitability of the pendulum method for such studies. (Q29, Zn)

50Q. Fatigue Strengths of Sintered Iron. (In German.) Max Hempel. *Stahl und Eisen*, v. 69, Nov. 10, 1949, p. 852-853.

Various factors affecting the mechanical strength. (Q7, Fe)

51Q. Concerning the Relationship of Saturation Value to Strength of Cast Iron. (In German.) Franz Roll. *Neue Giesserei*, v. 36 (new ser., v. 2), Dec. 1949, p. 378-380.

Graphed data show that there is no definite correlation between the amount of carbon plus silicon and the tensile strength of cast iron. (Q23, CI)

52Q. Conversion of Vickers Hardness Into Rockwell C Hardness. (In German.) H. Meincke. *Archiv für Metallkunde*, v. 3, Oct. 1949, p. 354-358.

Points out an error in previously published conversion tables and curves and formulates a mathematical relation to correct and standardize the conversion table. 11 ref. (Q29)

53Q. Strength Studies on Sand-Cast Al-Zn-Mg-Cr-Ti Alloys. (In German.) W. Bungardt and H. Gröber. *Archiv für Metallkunde*, v. 3, Nov. 1949, p. 396-399.

H. Brown described a self-aging Al alloy containing 5.5% Zn, 0.5% Mg, 0.5% Cr, and 0.2% Ti (*Aero Digest*, May 1943), said to have superior properties. Results of comparative study of this alloy and silumin (7% Si and 0.3% Mg) indicate that while Brown's claims are largely justified, silumin is for many purposes equal, if not superior. (Q23, Al)

54Q. The Damping Properties of Carbon Steels When Stressed in Their Elastic Deformation Range. (In German.) E. Diepschlag and H. Müller. *Archiv für Metallkunde*, v. 3, Nov. 1949, p. 400-406.

Determined for ten different steels ranging in carbon content from 0.08 to 0.93%. The specimens were tested as received and after heat treatment at two different temperatures. Results show that one must distinguish damping phenomena in the plastic deformation range from those in the elastic range, and that damping

properties increase with grain size. 28 ref. (Q9, CN)

55Q. Nondestructive Testing of the Al-Mg-Zn Alloy Hy 43 by a Magneto-Inductive Method. (In German.) G. H. Vossühler. *Metall*, v. 3, Aug. 1949, p. 247-251; Sept. 1949, p. 292-295.

Use of instrument known as the "Durokawi meter". Data on hardness, tensile strength, and electrical resistance of Alloy Hy 43. Brinell hardness and electrical resistance after hardening at 20 and 100° C. are correlated. (Q29, P15, Al)

56Q. Brinell Hardness and Impact Strengths of Several Standard Aluminum Alloys. (In German.) A. Buckeley. *Metall*, v. 3, Oct. 1949, p. 330-331.

Al-Zn-Cu and Al-Si-Cu alloys were tested for the above properties at temperatures up to 200° C. (Q29, Q6, Al)

57Q. The Wear Effect of Sand Blasting on Metals. (In German.) Karl Wellinger. *Zeitschrift für Metallkunde*, v. 40, Oct. 1949, p. 361-364.

In order to determine the relative wear resistance of sand-blast nozzles, the behavior of five different steels was studied. Wear of sand-blasting equipment and parts was found to be partly frictional wear and partly "impact" wear. The magnitude of wear as affected by material, nozzle design, and arrangement. Explains certain phenomena which previously seemed anomalous. (Q9, SG-m)

58Q. Wear Resulting From Sliding Friction. Its Causes and Investigation. (In German.) Otto Hermann Hummel. *Zeitschrift für Metallkunde*, v. 40, Oct. 1949, p. 365-371.

Studied from a crystallographic and metallographic point of view. Testing apparatus and method. Results are critically evaluated. (Q9)

59Q. Concerning the Relationship Between the Hardness Curves and Tensile Strengths of Metals. (In German.) Rudolf Böken. *Zeitschrift für Metallkunde*, v. 40, Oct. 1949, p. 372-374.

Numerous test values suggest that tensile strengths may be computed from their respective Meyer or Ludwik hardnesses, since the tensile strength vs. hardness ratio is nearly constant and practically unaffected by the hardening effect of the indenter. The average conversion factor of 0.3 for steels and nonferrous metals is unaffected by previous cold working or heat treatment between 20 and 300 or between 370 and 570° C. (Q23, Q29)

60Q. Adsorption Effect During Alternating Torsion in Connection With the Problem of Fatigue of Metals. (In Russian.) P. D. Novokreshchenov, N. E. Markova, and P. A. Rebiner. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 21, 1949, p. 549-552.

Attempts to establish a law of the adsorption effect during alternating torsion at low frequencies and high amplitudes. Experimental investigation was conducted using thin wires (poly and monocrystalline) 1 mm. in diam. and 10 mm. in length, using oleic acid as surface-active agent. 17 ref. (Q7)

61Q. Some General Laws of the Process of Elastic-Plastic Deformation. (In Russian.) I. I. Goldensblat. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., Oct. 21, 1949, p. 1005-1008.

Theoretical investigation. Proposes a new generalized formula, which is interpreted for different values of the variables. (Q24)

62Q. A New Criterion of Brittleness and Plasticity of Metals. (In Russian.) G. V. Uzhik. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sci-

ences of the USSR), new ser., Oct. 21, 1949, p. 1037-1039.

Proposes evaluation of the above on the basis of ratio of tensile strength and resistance to shear. Mathematical analysis showing validity of this criterion. (Q23)

63Q. Method of Hardness Testing at High Temperatures. (In Russian.) I. I. Mirkin and D. E. Livshits. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1080-1087.

For temperatures above 600° C. Uses a metal-ceramic indenter, protected from oxidation by a special thermal diffusion treatment. Hardness at high temperature characterizes effect of aging and influence of alloying elements in heat resistant alloys more correctly than hardness at room temperature. Details of apparatus and typical data. (Q29)

64Q. Concerning Calculation of Hardness. (In Russian.) V. K. Grigorovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1088-1094.

Method is based on determination of the area of the projection of the indentation for all basic types of indenters. This method is distinguished by simplicity of calculation. (Q29)

65Q. Investigation of Cold Brittleness of Steel on the Basis of a Conical Indentation Parameter. (In Russian.) F. S. Savitskiy, I. A. Zakharov, and B. A. Vandyshew. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1095-1099.

Simple method for evaluating steels with respect to their tendency to brittle fracture on the basis of a linear relationship between the ratios of depth to diameter of indentation and of yield point to yield strength, established for a series of metals. 14 ref. (Q23, ST)

66Q. Fracture of Tough Material in Compression by Shear. (In Russian.) S. I. Gubkin, A. N. Danilchenko, and V. G. Osipov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1100-1101.

Investigated for steel containing 0.19% C, 0.58% Mn, 0.63% Cr, 0.47% Ni, and 0.40% Cu at temperatures between room and 1300° C. It was found that shear fracture may follow two paths: in a plane at an angle of 45° to the direction of the applied force and in a plane parallel to the axis of the applied force at an angle of 45° to the radius. (Q26, AY)

67Q. Apparatus for Testing Materials Under Complex-Stress Conditions. (In Russian.) M. L. Bernshtein, W. M. Onchukov, and I. A. Yarov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1136-1138.

Machine which permits testing to be done at room and elevated temperatures under complex-stress conditions—bending plus tension. (Q25)

68Q. Structural Improvement of the Amsler Test Machine (Old-Type). (In Russian.) W. W. Aistov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1139-1140.

Wedge device which eliminates the spring of the counterweight and renders unnecessary introduction of correction coefficient in calculation of work expended in fracture of test specimens. (Q27)

69Q. Concerning the Isotropy of Rolled Steel in Relation to Its Tendency Towards Brittle Fracture. (In Russian.) L. A. Glikman and E. M. Shevandin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Oct. 1949, p. 1218-1228.

Investigated for carbon and Cr-Mo steels. Method of investigation and data. (Q23, CN, AY)

70Q. Experimental Utilization of a "Pulsator" for Endurance Testing of

Gear Teeth. (In Russian.) R. S. Nikolaev and L. M. Shkol'nik. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Oct. 1949, p. 1264-1265.

Modified apparatus intended to render conditions of testing more similar to those actually encountered in service. (Q7)

71Q. Evaluating Notch Toughness. R. W. Vanderbeck and M. Gensamer. *Welding Journal*, v. 29, Jan. 1950, p. 37S-48S.

Meaning of transitional behavior for the various types of specimens. Reasons for believing that actual ship behavior is best evaluated by consideration of low levels of energy absorption, and that an evaluation can be readily obtained from key-hole or V-notch Charpy impact values. 25 ref. (Q6, Q23)

72Q. Frictional Properties of Lead-Base and Tin-Base Bearing Alloys. *Product Engineering*, v. 21, Jan. 1950, p. 143-144. Condensed from "The Frictional Properties of Lead-Base and Tin-Base Bearing Alloys", D. Tabor, Council for Scientific and Industrial Research, Bulletin No. 212.

Results of investigation. Data are tabulated. (Q9, Pb, Sn, SG-c)

73Q. Influence of Stress Concentration, Speed of Deformation, and Temperature on the Rupturing Strength of Steels. A. Guessler and R. Castro. *Engineers' Digest*, v. 10, Oct. 1949, p. 350-354; Dec. 1949, p. 412-414. Translated and condensed.

Previously abstracted from *Revue de Metallurgie*. See item 3A-250, 1949. (Q23, ST)

74Q. Friction and Adhesion of Clean Metals. F. P. Bowden and J. E. Young. *Nature*, v. 164, Dec. 24, 1949, p. 1089-1090.

It is well known that development of high friction and ultimately of seizure between rubbing metal surfaces is greatly facilitated by progressive cleaning, particularly in the final stages. Further experiments show that with clean surfaces complete seizure occurs. (Q9)

75Q. (Book) Proceedings of the Seventh International Congress for Applied Mechanics, 1948. Introduction. 129 pages. Imperial College of Science and Technology, South Kensington, London, England.

First of six volumes giving proceedings of a meeting held in London in Sept. 1948. It contains two addresses on turbulent flow, one on experimental stress analysis, an abstract on mathematical theory of plasticity, editor's introduction, complete list of papers, and names of members of the Congress. (Q general)

76Q. (Book) Proceedings of the Seventh International Congress for Applied Mechanics, 1948. Vol. 1. 432 pages. Imperial College of Science and Technology, South Kensington, London, England.

Proceedings of meeting held in London in Sept. 1948 contains about 36 papers in full and 24 in abstract form, dealing with theoretical and experimental approaches to problems of plasticity and elasticity, stress and strain, stresses in structures and shapes, etc. Many of the individual papers are separately abstracted. (Q general)

77Q. (Book) Modern Steels and Their Properties; Carbon and Alloy Steel Bars. 228 pages. 1949. Bethlehem Steel Co., Bethlehem, Pa.

Steelmaking procedure. Effect of size or mass on mechanical properties. (Q general, D general, ST)

78Q. (Book) The Creep of Metals and Alloys. E. G. Stanford. Temple Press, Ltd., Bowling Green Lane, London E.C.1, England. 15 s.

Creep testing; the creep curve;

metallurgical factors affecting creep; methods for presenting creep-test results; and mechanism of creep. (Q3)

R

CORROSION

1R. Corrosion Fatigue Cracking in Steam Piping. *Combustion*, v. 21, Dec. 1949, p. 57-58.

Causes of corrosion fatigue cracking in a number of British power stations. (R1, R4)

2R. Caustic Soda Versus Construction Materials. *Chemical Engineering*, v. 56, Dec. 1949, p. 213-214, 216, 218, 220.

Part I of a symposium in which a representative group of construction materials are evaluated for services involving caustic soda. Includes "Chlorimet", Walter A. Luce; "Worthite", W. E. Pratt; "Lead", Kempton H. Roll; and "Glass Linings", S. W. McCann. (R5)

3R. Corrosion Inhibitors for Steel. W. G. Palmer. *Journal of the Iron and Steel Institute*, v. 163, Dec. 1949, p. 421-431.

Experimental results show that many inhibitors, added to water or chloride solution in amounts insufficient to completely stop attack, produce localized attack, which is more intense than the corrosion in the absence of an inhibitor. It is believed that the attack is caused by formation of blister-like membranes over the sensitive points, which prevent access of inhibitor to the places where it is required. By using suitable mixtures of phosphate and chromate (or phosphate and persulfate) the danger can be avoided. (R10, ST)

4R. On the Mechanism of Oxidation of Nickel-Platinum Alloys. O. Kubaschewski and Ortrud Von Goldbeck. *Journal of the Institute of Metals*, v. 76, Nov. 1949, p. 255-267.

The mechanism of oxidation of binary alloys at high temperatures on the basis of measurements of the rate, between 600 and 1100° C, of Ni-Pt alloys containing 0-90 at.-% Pt, and the theory of C. Wagner. Results are expressed in terms of a "corrosion constant" which is the ratio of the square of the decrease in thickness of the metal layer to the time. Observations suggest that a diffusion process within the oxide layer determines the rate of oxidation. Conclusions may be generally applicable to other similar alloys. 24 ref. (R2, Ni, Pt)

5R. Corrosion-Erosion of Boiler Feed Pumps and Regulating Valves at Marysville, Second Test Program. J. M. Decker, H. A. Wagner, and J. C. Marsh. *Transactions of the American Society of Mechanical Engineers*, v. 72, Jan. 1950, p. 19-24; discussion, p. 24-26.

Corrosion-erosion tests at 320 and 385° F. indicated that at these temperatures, carbon steel is attacked to a lesser extent than at 250° F., whereas the reverse is true of the Cr-bearing steels. However, rate of attack of Cr steels is still only a fraction of that of carbon steels, so that use of alloy steels for boiler-feed-pump parts is warranted at the higher temperatures also. Of two bronzes tested "Navy M" appeared satisfactory up to 320° F.; a leaded bronze was unsatisfactory at all test temperatures. (R1, ST, Cu)

6R. Corrosion Testing of Buried Cables. T. J. Maitland. *Corrosion* (Technical Section), v. 6, Jan. 1950, p. 1-6; discussion, p. 6-8.

Methods used in connection with cables of various types of construction.

tion. Frequency of test points, method of selection, type of instruments employed, and method of analyzing results. A few typical examples illustrate results of corrosion tests and protective measures used to correct unsatisfactory conditions. (R8)

7R. Corrosion and Protection of Mine Hoist Ropes. F. L. LaQue. *Corrosion* (Technical Section), v. 6, Jan. 1950, p. 8-13.

Detailed investigation includes photographs of cross sections of new "rope" (steel cable) and of rope after various amounts of use, showing wear and corrosion existing at various distances from the drum spout. Size-reduction, elongation, and breaking-strength variations along the rope from drum to cage are shown graphically. (R general, T28)

8R. Experience With Condenser Tubes at a Major Oil Refinery. S. J. Van Der Baan. *Corrosion* (Technical Section), v. 6, Jan. 1950, p. 14-18.

Experience with Al brass tubes at the Curacao Refinery of the Royal Dutch-Shell Group. Relative resistances of various compositions of Al brass. Corrosion by acidic condensate, impingement attack, dezincification, stress-corrosion cracking, fatigue, corrosion fatigue, and high-temperature attack at hot spots. (R4, T29, Cu)

9R. Preparation of Pipe Surface for Bitumen Coating During Reconditioning. O. C. Mudd. *Corrosion* (Technical Section), v. 6, Jan. 1950, p. 19-21; discussion, p. 21-22.

Discusses various methods from the point of view of effectiveness and cost. Most corrosion products and soil particles are inert in the absence of moisture and their retention, particularly when adherence is good, will not impair coating effectiveness if moisture is removed. Solution of diluted pipe primer is found effective in reducing moisture content of the residual foreign products on the pipe surface. (R8, L26)

10R. Corrosion of Wet Steel by Hydrogen Sulfide-Air Mixtures. D. C. Bond and G. A. Marsh. *Corrosion* (Technical Section), v. 6, Jan. 1950, p. 22-26; discussion, p. 26-28.

Experimental apparatus and procedure; and results. (R5, ST)

11R. The Cost of Corrosion to the United States. Herbert H. Uhlig. *Corrosion* (Technical Section), v. 6, Jan. 1950, p. 29-33.

Previously abstracted from *Chemical and Engineering News*. See item 6A-118, 1949. (R general, A4)

12R. Mechanism of Oxygen Reduction at an Iron Cathode. Walter A. Patrick and Herman B. Wagner. *Corrosion* (Technical Section), v. 6, Jan. 1950, p. 34-38.

Refers to previous articles in which H_2O was assumed to be an intermediate in the corrosion reaction, particularly where ferrous materials are involved. Experiments with iron-amalgam cells. Inspection of data show that the greatest yields of peroxide were obtained in alkaline solutions with small current densities. 15 ref. (R1)

13R. Mitigation of Oil Field Corrosion. Paul L. Menaui. *World Oil*, v. 130, Jan. 1950, p. 152-154, 157.

Effect and cost of corrosion, underlying causes and methods for coping with the trouble. Use of aldehydes as inhibitors. (R10, T28)

14R. Joints and Clamps for Aluminum Conductors. Gordon B. Tebo. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part II, 1948, p. 1145-1150; discussion, p. 1150.

Previously abstracted from *Electrical Engineering*. See item 6c-39, 1948. (R3, T1, Al)

15R. Heating Metal Specimens in Corrosion Tests. R. F. Thirsk, G. H. Botham, and G. A. Dummatt. *Nature*, v. 164, Dec. 10, 1949, p. 1015.

In determining resistance of metals to boiling organic liquids, various methods of heating were tested. Greater solution rates and better reproducibility of results were obtained by induction heating. (R11)

16R. Marine Boiler Deterioration. I. G. Slater and N. L. Parr. *Institution of Mechanical Engineers, Proceedings*, v. 160, Dec. 1949, p. 341-350; discussion, p. 350-358.

See abstract of condensed version from *Engineer*, item 6B-47, 1949. (R4)

17R. Causes of Flue Gas Deposits and Corrosion in Modern Boiler Plants. W. F. Harlow. *Institution of Mechanical Engineers, Proceedings*, v. 160, Dec. 1949, p. 359-368; discussion, p. 369-379.

See abstract of condensed version in *Engineer*, item 6B-56, 1949. (R9)

18R. Original Remarks Concerning the Corrosion of Compressed-Gas Cylinders. (In French.) A. Pignot. *Chaleur & Industrie*, v. 30, Oct. 1949, p. 249-254.

Failures resulting from internal corrosion. Respective merits of the various metals and alloys for this use. Effect of HCN in the gas and need for more thorough purification of city gas. (R9)

19R. Some Remarks on the Theory of Corrosion Resulting From Local Galvanic Action. (In German.) G. Masing. *Archiv für Metallkunde*, v. 3, Oct. 1949, p. 343-346.

A critical experimental study of the theories of differential aeration, based on Wickert's and Evans' theories. 16 ref. (R1)

20R. Recent Developments in the Electrochemistry of Metallic Surfaces. (In German.) K. Wickert. *Archiv für Metallkunde*, v. 3, Oct. 1949, p. 346-353.

Surveys recent literature on chemical and electrochemical corrosion, and the various theories. 36 ref. (R1)

21R. Local Element Effect and the Solution of Iron. (In German.) F. Todt. *Archiv für Metallkunde*, v. 3, Oct. 1949, p. 353-354.

Wickert's criticism of Evans' theory of corrosion. Criticizes Wickert's test procedure and theory. (R1)

22R. Concerning the Primary Corrosion Process. (In German.) H. Brubitsch. *Archiv für Metallkunde*, v. 3, Nov. 1949, p. 394-396.

Because of deficiencies in the "local-element" theory of corrosion, an investigation was made to determine whether or not adsorption is the primary factor. Since adsorption-active spots on the metal surface were shown to be identical to local cathodes or anodes, the theory appears to be valid. (R1)

23R. Adsorption Balances for Investigation of Gas Corrosion of Metals and Alloys at High Temperatures. (In Russian.) I. A. Makolkin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Oct. 1949, p. 1209-1212.

A newly designed adsorption balance, which is said to be much superior to that of Leontis and Rhines from the points of view of accuracy, sensitivity, and suitability for use at temperatures above 1000° C. (R9)

24R. Potential of Corroding Iron Structures and Protective Potential Under Conditions of Cathodic Protection. (In Russian.) I. N. Frantsevich and T. Franktsevich-Zabludovskaya. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Aug. 1949, p. 793-800.

Potentials formed on stainless steel test specimens in a model gas duct

were determined. Nature of processes inducing such potential is theoretically interpreted. (R10, SS)

25R. Passivation of Iron by Adsorption-Paint Coatings. (In Russian.) G. S. Koshurnikov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Aug. 1949, p. 809-811.

Investigation shows that chemically adsorbed layers passivate iron in acid media. Mechanism of passivation is postulated. Passivating effect may be increased by coating the layers with polymerizing lacquers. (R10, L26)

26R. Corrosion of Molybdenum-Bearing Stainless-Steel Weld Metals. Anton L. Schaeffler and R. David Thomas, Jr. *Welding Journal*, v. 29, Jan. 1950, p. 13S-24S; discussion, p. 24S-31S.

Eleven compositions of weld metal within the range of analysis of Types 316, 317, 318 (316Cb) and extra low carbon 316 were subjected to boiling 65% HNO_3 and to boiling $CuSO_4-H_2SO_4$. Each composition was tested in the as-welded state and in four conditions of heat treatment. Compositions were varied to produce microstructures with ferrite from 0 to 8%. 10 ref. (R5, K general, SS)

27R. Operating Problems in Gas Treating for Hydrogen Sulfide Removal. J. S. Connors and A. J. Miller. *Petroleum Processing*, v. 5, Jan. 1950, p. 29-31.

Many corrosion and other operating problems connected with the above are also experienced by petroleum refiners in treating refinery gases from sour crude. The modified iron-oxide process is being used in treating natural gas where the H_2S content is low. (R9, T29)

28R. Influence of Gas Adsorption on the Formation of Thin Films. (In French.) Marcel Perrot and Suzanne Argaix. *Comptes Rendus* (France), v. 229, Nov. 28, 1949, p. 1139-1142.

The spontaneous aging of thin films of silver was studied under reduced pressure in the presence of dry air, "laboratory air", and air saturated with water vapor. Variations of electrical resistance and of reflection factor with time and with pressure of the atmosphere are charted. (R2, P general, Ag)

29R. Crystallochemical Mechanism of Formation of Oxide Films on Iron at Room Temperature. (In Russian.) P. D. Dankov and N. A. Shishakov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, Sept. 1949, p. 1031-1035.

Electron-diffraction investigation of individual stages of formation of oxide. Factors involved, such as amount of oxygen, pressure. (R2, M22, Fe)

30R. Inter-crystalline Corrosion of Aluminum Alloys. 2. Alloys of the System Al-Zn-Mg. (In Russian.) A. I. Golubev. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, Sept. 1949, p. 1116-1126.

Corrosion resistance of the inter-metallic compound $MgZn$, precipitating along the grain boundaries in alloys of the above system was investigated. A theory of corrosion cracking of these alloys is developed. (R2, Al)

31S. Spectrographic Analysis of Ductile Cast Iron. J. T. Rozsa. *Iron Age*, v. 164, Dec. 22, 1949, p. 73-75.

Spectrographic techniques for rapid, low-cost determination of Mg

and Ce. Accuracy and reproducibility obtainable. (S11, C1)

25. Spectrographic Methods for Determining Magnesium in Nodular Iron. Ford R. Bryan, G. A. Nahstoll, and H. D. Veldhuis. *ASTM Bulletin*, Dec. 1949, p. 69-72.

A spectrographic solution method for analyzing metal rods to be used as standards for the control analysis. A technique for determining Mg as a part of the customary spectrographic analysis of cast iron rods or pins. (S11, C1)

38. Bath Temperature Measurements. J. G. Mravec. *Blast Furnace and Steel Plant*, v. 37, Dec. 1949, p. 1447-1450.

Methods for measuring the temperature of molten steel. (S16)

45. Application of Ultrasonic Testing to Steel Plant Metallurgical Control. J. V. Russell. *Non-Destructive Testing*, v. 8, Fall 1949, p. 7-11.

History, fundamentals, and general applications. Metallurgical applications and procedures. 15 ref. (S13)

55. General Material, Process and Quality Control by Non-Destructive Testing. Milfred J. Parker. *Non-Destructive Testing*, v. 8, Fall 1949, p. 15-17.

Equipment, procedures, and applications. (S general)

65. Ultrasonic Testing. Donald Erdman. *Non-Destructive Testing*, v. 8, Fall 1949, p. 28-30.

Recent developments. (S13)

75. Non-Destructive Testing and Inspection as Based on Factory and Field Operations. Kenneth E. Rush. *Non-Destructive Testing*, v. 8, Fall 1949, p. 30-32.

Dimensional inspection; superficial inspection; miscellaneous inspection; and physical properties of parts. (S general)

85. Radiography With Cobalt-60. Adair Morrison. *Nucleonics*, v. 5, Dec. 1949, p. 19-32.

Graphs, from which exposure times for a range of thicknesses of steel and for different types of films can be determined. Information useful in handling and shipping of cobalt-60. 11 ref. (S19, S13, C1)

95. Fixed Gages—Their Design, Application, and Use. F. Steele Blackall. *Instruments*, v. 22, Dec. 1949, p. 1149-1151.

Use of fixed gages, with consideration to design of precision gage blocks; plain cylindrical, linear, and width gages (plug gages, ring gages, snap gages, length gages); thread gages; and special gages (taper gages, spline gages, contour gages, flush pin gages, functional gages). (S14)

105. Recent Developments—Measurement of Metal Thickness From One Side. Dwight J. Evans. *Petroleum Refiner*, v. 28, Dec. 1949, p. 109-112.

Electronic instrument which operates on the ultrasonic resonance principle. It has a range of 1/16 to 12 in. of steel. (S14)

115. High-Temperature Thermocouple. New Metal Combination Measures up to 2200° C. Walter C. Troy and Gary Steven. *Frontier*, v. 12, Dec. 1949, p. 6-8, 22-24.

See abstract of "The Tungsten-Iridium Thermocouple for Very High Temperatures", *American Society for Metals*, Preprint, item 13-58, 1949. (S16)

125. The Polarograph in Zinc-Base Die Casting Metal Analyses. E. G. Ford. *Canadian Chemistry and Process Industries*, v. 33, Dec. 1949, p. 1051-1054, 1060.

Procedures and applications of polarographic technique, which enables a laboratory which does not have a spectrograph to make accu-

rate high-speed determinations. (S11, Zn)

135. Piston Assemblies: A Review of Operating Results in Road Transport Oil Engines. J. L. Hepworth. *Automobile Engineer*, v. 39, Dec. 1949, p. 528-534. (Condensed version in *Engineering*, v. 168, Dec. 9, 1949, p. 629-632.)

Means for avoidance of piston failures. Limiting factors of piston life as indicated by oil consumption. Rates of wear of the various components of the piston assembly. Service test results with different piston-ring materials; improved materials; design suggestions. (S21, Q9, T25)

145. Inspection and Testing. *Steel*, v. 126, Jan. 2, 1950, p. 184, 186, 188.

Brief reviews and forecasts: Sonic Testing Training Expensive but Worthwhile, R. W. Snowdon. Analysis of Several Elements at Once Ultimate Objective, M. A. Cordovi. Industry to Benefit by Scientific Quality Control, J. R. Steen. Non-destructive Testing Seen Invaluable to Production, F. B. Doane. Sees Wider Usage of X-Ray Gage During 1949, W. C. Hutchins. Nondestructive Testing Aimed at Preventing Scrapped Parts, Leslie W. Ball. Industrial Research Aims at Lower Costs, Better Quality, Arthur E. Pocke. Volume of Spectrographical Work Boosted by Research, W. B. Coleman. Instrument Production Revives in Europe, George Scherr. Use of New Pyrometer Results in Better Quality Castings, J. Manuele. (S general)

155. Heat-Conduction Errors in Temperature Measurements. L. E. Smith. *Transactions of the American Society of Mechanical Engineers*, v. 72, Jan. 1950, p. 71-76.

Various thermometer-bulb assemblies used. Experimental magnitude of the heat-conduction error possible in media with low and high heat-transfer coefficients and in a medium with a high heat-transfer coefficient (water). Effect of heat-conduction error on the over-all response in simulated practical installations. (S16)

165. A Better Way To Assay Cyanide Mill Solutions. A. Kenneth Schellinger. *Engineering and Mining Journal*, v. 151, Jan. 1950, p. 74-75.

New method, using test lead and HCl, takes only 20 min., increases accuracy, and uses lower cost materials. (S11)

175. Photoelectric Colorimetry. Rafael F. Muraca. *Plating*, v. 37, Jan. 1950, p. 53-58, 68.

The development, construction, and principle of operation of photoelectric colorimeters used in analysis of a wide variety of materials. (S11)

185. The Design and Construction of Sensitive Fluorophotometers. Part I. Principles. G. R. Price. *U. S. Atomic Energy Commission*, AEC-D-2677, Apr. 1948, 18 pages.

For uranium analysis. Design stresses convenience in operation rather than economy in construction. (S11, U)

195. Gas Temperature Measurement Above 1500° C. R. Mayorcas. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 3, 1948, p. 310-312.

Previously abstracted from *Journal of the Institute of Fuel*. See item 13-53, 1949. (S16)

205. X-Ray Thickness Gauge for Cold-Rolled Strip Steel. W. N. Lundahl. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part I, 1948, p. 83-90.

Previously abstracted from condensed version in *Electrical Engineering*. See item 12a-47, 1948. (S14, F23, ST)

215. Electronic Circuits of a Super-sonic Reflectoscope. Ralph B. DeLano, Jr. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part I, 1948, p. 128-132.

Circuits and their operation with raw a.c. power. The device is used for nondestructive testing and measuring of solid parts. (S13)

225. An X-Ray Thickness Gauge for Hot-Strip Rolling Mills. C. W. Clapp and R. V. Pohl. *Transactions of the American Institute of Electrical Engineers*, v. 67, Part I, 1948, p. 620-626.

X-ray theory of gaging. Operating performance of gage, safety considerations, and other applications. (S14, F23)

235. Measuring the Temperatures of Molten Metal. (In German.) Kurt Guthmann. *Archiv für Technisches Messen*, Nov. 1949, p. T96-T98 (6 p.).

Surveys the literature. Methods and equipment. 21 ref. (S16)

245. Photometric Rapid Processes in the Foundry Laboratory. (In German.) Hans Pinsl. *Neue Giesserei*, v. 36 (new ser., v. 2), Dec. 1949, p. 380-386.

Procedure for determining constituents and impurities in pig and cast iron and in alloy steels. How several elements can be analyzed by the above method in one operation. 17 ref. (S11, C1)

255. Measuring the Wall Thicknesses of Light-Metal Cast Parts with Dr. Forster's "Sondenkwameter" (Special Thickness Measuring Device). (In German.) Ph. Schneider. *Metall*, v. 3, Oct. 1949, p. 321-326.

Design and use of a new electromagnetic instrument. Effect of various factors on readings of the instrument. Typical data. (S14)

265. Analytical Errors Caused by Heterogeneous Composition and by Impurity Inclusions. (In German.) O. Niezoldi. *Archiv für Metallkunde*, v. 3, Oct. 1949, p. 341-343.

Despite careful sampling, analytical results may not give average composition. Author recommends giving the analyst more information to aid in selection of technique and interpretation of results. (S11)

275. X-Ray Method for Determination of Coating Thicknesses by a Superposition Method. (In Russian.) L. S. Polatnik. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Sept. 1949, p. 1043-1054.

New methods that may be extended to cases in which coating or lining contains complex chemical compounds, whose structure is unknown, solid solutions consisting of light and heavy elements, or mixtures of several uniformly distributed phases. As an example, the method was applied to determination of the thickness of a layer of Fe₂O₃ on oxidized steel. 15 ref. (S14)

285. Investigation of the Effect of Arcing and of Third Elements During Spectrographic Analysis. II. Investigation of the Nature of the Influence of Third Elements. (In Russian.) L. N. Filimonov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Oct. 1949, p. 1178-1193.

Experimental results indicate that "third elements" cause an exchange reaction between components of the alloy and their oxides in the process of oxide-film formation, which commences and then ceases during arcing. Method of investigation and data obtained. (S11)

295. Methods of Spectroscopic Analysis of Ferro-Alloys. (In Russian.) M. V. Babaev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Oct. 1949, p. 1193-1197.

Existing methods and hints for improvement, particularly with respect to determination of Si in high-Si ferrochromium. (S11, Fe)

30S. **Magnaflux Inspection of Welded Storage Tanks.** F. A. Upson. *Welding Journal*, v. 29, Jan. 1950, p. 27-30.

Optimum procedure. Surface finishing, spacing of prods, thickness of material, amount of powder, etc. Limitations of the method. (S13)

31S. **Rapid-Responding Devices Control High-Speed Reheating of Seamless Steel Tubes.** H. W. Cox. *Steel*, v. 126, Jan. 16, 1950, p. 64-66, 68.

Successful regulation of new high-gradient heating process at National Tube's Gary plant is made possible by use of radiation pyrometers. (S16, F26)

32S. **Installation and Maintenance of Pyrometers for the Heat Treatment Shop.** G. Oestereich. *Engineers' Digest*, v. 10, Dec. 1949, p. 433-434. Translated and condensed from *Werkstatt und Betrieb*, v. 82, Oct. 1949, p. 367-369.

Apparatus and circuits. Recommended procedures. (S16, J general)

33S. **Radiography With Beta-Rays.** Torbjörn Westermarck. *Nature*, v. 164, Dec. 24, 1949, p. 1086-1087.

Some examples, characteristics and advantages. (S13)

34S. **The Life Testing of Engine Components.** S. T. Harrison. *Metal Industry*, v. 75, Dec. 23, 1949, p. 535-538.

Equipment and procedures used for testing various components of British aircraft gas turbines. (S21, Q general)

35S. **Comparison Measurement of Slip Gauges Using an Anvil of Transparent Material.** A. W. Musk. *Machinery* (London), v. 75, Dec. 29, 1949, p. 919-924.

Investigation to determine the best method of supporting the slip gage during test when using high-magnification comparators. The flat, grooved, hardened-steel anvil; the three-ball support; and the annulus-type of support have all been tried. New type of anvil developed. (S14)

36S. **Apparatus for Determination of Variation of Wall Thickness of Tubes.** (In Russian.) G. S. Ratushev and B. F. Sevastyanov. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, Sept. 1949, p. 26.

Mechanical gaging apparatus. (S14)

37S. **Application of Models to Unipolar Induction Problems in Electromagnetic Inspection.** (In Russian.) V. V. Vlasov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 69, Nov. 1, 1949, p. 37-40.

Theoretical and experimental investigation of the possibility of using models instead of extremely complex mathematics to work out problems. Applied mainly to defects in metallic objects. (S13)

38S. (Book) **Modern Instrumental Analysis.** Vol. 1. David F. Boltz, Editor. 191 pages, 1949. Edwards Brothers, Inc., Ann Arbor, Michigan.

Quantitative spectrochemical analysis, application of spectrochemical analysis, mass spectrometry, optical instruments, electron diffraction, and X-ray diffraction. (S11)

2T. **Light-Alloy Bearings in Germany.** *Light Metals*, v. 12, Dec. 1949, p. 664-667.

Diagrams and tables give dimensional details of automotive crankshaft and connecting-rod bearings. Al alloy compositions are given. (T7, Al)

3T. **A Modern Aluminium-Framed Glasshouse.** F. J. Dean. *Light Metals*, v. 12, Dec. 1949, p. 668-673.

Practical and economic advantages of light-alloy construction. (T26, Al)

4T. **Awheel at Earls Court.** *Light Metals*, v. 12, Dec. 1949, p. 676-680.

Various applications of Al demonstrated at recent British "Motorcycle and Cycle Exhibition". (T10, Al)

5T. **Duralumin H Shuttering and the Wimpey "Situfocam" Construction System.** *Light Metals*, v. 22, Dec. 1949, p. 681-685.

Foamed-concrete housing construction in which Al alloy forms play an important role. (T26, Al)

6T. **The Bitumetal Roof.** *Light Metals*, v. 12, Dec. 1949, p. 686-689.

Roofing system based on corrugated Al sheet and bituminous covering. (T26, Al)

7T. **At the Dairy Show.** *Light Metals*, v. 12, Dec. 1949, p. 690-694.

Applications of Al and alloys exhibited at British show. (T3, Al)

8T. **Comparative Tests of Aluminum and Galvanized Ducts.** *Sheet Metal Worker*, v. 41, Dec. 1949, p. 48.

Four different types of hot-air ducts were tested for insulating properties: bare aluminum; bare galvanized iron; galvanized iron covered with asbestos paper; and galvanized iron covered with $\frac{3}{4}$ -in. Asbestocel insulation. Additional tests were made after painting the bare galvanized-iron duct with aluminum, and after wrapping the asbestos-paper-covered duct with aluminum foil. Results indicate superiority of bare aluminum for new installations and of Al foil wrapping to improve efficiency of galvanized-iron ducts. (T27, Al, Zn)

9T. **Light Strong Rail Steel Finds Increasing Acceptance by Western Manufacturers.** *Western Metals*, v. 7, Dec. 1949, p. 28-29.

Varied uses. Having approximately 50% greater strength than mild steel, rail steel provides an opportunity to use lighter sections and gages without sacrificing strength, stiffness, and resiliency. (T23, ST)

10T. **Washer Leadership.** *Modern Metals*, v. 5, Dec. 1949, p. 16-23.

Procedures and equipment used in production of Maytag washers, in which aluminum plays a major role. Foundry practice plus secondary working operations are emphasized. (T10, Al)

11T. **Grain Storage Bins: Year's Biggest New Use for Aluminum.** *Modern Metals*, v. 5, Dec. 1949, p. 26-27.

(T3, Al)

12T. **Big Business.** *Aluminum Storm Windows.* *Modern Metals*, v. 5, Dec. 1949, p. 30-32.

Fabrication procedures. Extrusion, aging, machining, and assembly are the principal processes. (T26, Al)

13T. **Sewaren Welded Aluminum Bus Proves Practicable and Economical.** D. M. Quick. *Electric Light and Power*, v. 27, Dec. 1949, p. 58-63.

Large-scale application of welded aluminum bus for 13 and 132-kv. service in outdoor transformer yard, which resulted from comparative cost studies, supplemented by exhaustive tests. (T1, Al)

14T. **Aluminum Alloys for the Storage and Transportation of Chemicals.** E. D. Verink, Jr. *Corrosion* (News Section), v. 6, Jan. 1950, p. 1.

CARBON and SULFUR ANALYSIS

with

Speed!
Ease!
Accuracy!

TWO MINUTE CARBON DETERMINATOR

High degree of accuracy assured by fan cooling gases flowing to meniscus line, automatically maintaining atmospheric pressure, wide selection of carbon percentage scales. Accurate within 0.002% on low range Burette.



THREE MINUTE SULFUR DETERMINATOR

Determination in accordance with A.S.T.M. specification accuracy within 0.002% inorganic or organic materials. Simple procedure.



HIGH-TEMPERATURE FURNACE

Sturdy construction with HIGHEST QUALITY insulation.

Use 3031D Boats and Zircotubes to reduce operating cost of analysis.

Use Dietert-Detroit Carbon and Sulfur Determinators for Economical Analyses

Write to Dept. C-3 for descriptive literature

CONTROL EQUIPMENT

HARRY W.

DIETERT COMPANY

9330 ROSELAWN • DETROIT 4, MICH.

(41) FEBRUARY, 1950

APPLICATIONS OF METALS IN EQUIPMENT

1T. **Textile Machinery and Accessories.** *Light Metals*, v. 12, Dec. 1949, p. 655-664.

Applications of Al and Mg shown at the recent exhibition in England. (T29, Al, Mg)

Typical applications to large tanks, tank cars, and hopper cars. (T29, Al)

15T. Solid-Type Journal Bearings in High-Speed Freight Service. E. S. Pearce, R. J. Shoemaker, and I. E. Cox. *Transactions of the American Society of Mechanical Engineers*, v. 72, Jan. 1950, p. 1-8; discussion, p. 8.

Operating conditions involved in the selection of the bearing equipment used in high-speed freight service. Advantages of the solid type. Specific information on sleeves and bearings of the National Bearing Div., American Brake Shoe Co., and of Magnus Metal Corp. Mechanical properties of "Satco" (97-98% Pb) bearing metal. (T7, SG-c)

16T. Tests of Aluminum and Steel Railway Bridge Girders. E. C. Hartman, R. L. Moore, and F. E. Rebhun. *American Railway Engineering Association, Bulletin*, v. 51, Dec. 1949, p. 290-306.

Completion in 1946 of an all-aluminum plate girder span demonstrated that design and fabrication of such a structure was well within the scope of current engineering practice. Tests made after one year's service show that the behavior of the aluminum girders was in good agreement generally with that computed and that the action was as determinate as that of the steel girders of the same bridge. Tests were limited to an investigation of stresses and deflections under a single 228-ton steam locomotive. (T26, Q25, Al)

17T. Carbide in Gage Manufacture. F. Steele Blackall, III. *Tool & Die Journal*, v. 15, Jan. 1950, p. 64. Unusual use for carbides. (T8, SG-j)

18T. Types of Carbide Cutting Tools and Their Specific Applications. W. L. Kennicott. *Tool & Die Journal*, v. 15, Jan. 1950, p. 76-78, 103. (T6, SG-j)

19T. Design of a High-Temperature Resistance Furnace. F. H. McRitchie and N. N. Ault. *Journal of the American Ceramic Society*, v. 33, Jan. 1, 1950, p. 25-26.

Furnace capable of operating up to 3770° F. in vacuum or in hydrogen or rare-gas atmospheres. Problems of outgassing and atmosphere contamination by furnace materials are largely circumvented by eliminating insulation. (T5)

20T. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 42, Jan. 1950, p. 67A-68A.

Some recent developments in nodular cast iron as well as in fluorinated polymers for construction of corrosion resistant chemical equipment. (T29, R general, CI)

21T. How Gage Blocks Are Made. Ray Gierlich. *American Machinist*, v. 94, Jan. 9, 1950, p. 85-89. Equipment and procedures. (T8)

22T. Steels for Hobbing. L. Sanderson. *British Plastics*, v. 21, Dec. 1949, p. 673-675.

Selection of steels for hobbing, especially as used in the production of plastic molds. (T5, G16)

23T. Some Experimental Studies of Furnace Aerodynamics in the Iron and Steel Industry. M. P. Newby and R. D. Collins. "Proceedings of the Seventh International Congress for Applied Mechanics", v. 2, 1948, p. 164-176.

Problems of wear, power consumption, and mixing of two or more fluid streams. 12 ref. (T5, D general)

24T. Electric Furnace With "Kryptol" Resistors. (In French.) Jean Bernot. *Journal du Four Electrique et des Industries Electrochimiques*, v. 58, Sept.-Oct. 1949, p. 111-113.

Furnace improved by addition of

an automatic temperature regulating device. "Kryptol" is a form of carbon. It was introduced as a resistance material many years ago. Superiority over other materials is claimed. Various applications. (T5)

25T. Contribution to the Study of Variable Conditions in Furnaces, Heating a Vacuum Furnace of Constant Capacity. Experimental Study on a Semi-Industrial Scale. (In French.) V. Broida and Ch. Henry. *Chaleur & Industrie*, v. 30, Sept. 1949, p. 207-223; Oct. 1949, p. 239-248.

Experimental apparatus and procedure: A formula is derived for determination of one of three variables (temperature, time and calorific output), when two are known. Method of graphic interpretation. Theoretical basis of the method, applications, and conclusions. (T5)

26T. Sintered Bearings Instead of Ball and Friction Bearings, and Electroplated Bearings Instead of Cast Bearings—Two Production Problems. (In German.) W. Katz. *Metall*, v. 3, Sept. 1949, p. 295-296.

Recommends use of sintered bearings and bearings produced by electrodeposition for economic reasons. Properties of such bearings. (T7)

27T. Experiences With Bearing Materials on the German National Railways. (In German.) V. Schneider. *Metall*, v. 3, Oct. 1949, p. 327-330.

Experience with alloys of lead, zinc, and copper; cast iron and malleable cast iron; sintered iron (other sintered materials were not investigated); and synthetic resins. (T23, SG-c)

28T. Importance of Design to Tanks and Pressure Vessels. Walter Aamans. *Welding Journal*, v. 29, Jan. 1950, p. 7-16; discussion, p. 16-18.

Aims to show that sound engineering design cannot be assured solely by applying the formulas given in the Unfired Pressure Vessel Code. Need for more research. Considers specific types of components in detail. The nature of steel fracture; mechanical prospects vs. service needs; shape vs. stress distribution, etc. 12 ref. (T26, Q general)

29T. Balanced Production. *Die Castings*, v. 8, Jan. 1950, p. 21-22, 53.

In the production of the Ohaus triple-beam laboratory balance, Zn-alloy die castings have replaced conventional cast-iron and brass parts in order to give a highly standardized unit. (T8, Zn)

30T. Uniform Parts Assure Rapid Production. *Die Castings*, v. 8, Jan. 1950, p. 23-24.

Use of die-cast Zn and Al for basic parts of food mixers produced by Dormeyer Corp. (T10, Zn, Al)

31T. Taxi Meter Parts: Housing; Internal Framework; Functioning Parts. *Die Castings*, v. 8, Jan. 1950, p. 26-27, 53-55.

Use of Zn-alloy die castings. (T8, Zn)

32T. Redesign From Wood to Die Castings. *Die Castings*, v. 8, Jan. 1950, p. 28-30, 55-57.

Redesign of Executive intercommunication-system units to Zn-alloy die castings. (T8, Zn)

33T. Combining Durability and Lightness With Precision for Surveying Transits. *Die Castings*, v. 8, Jan. 1950, p. 32-35.

Use of Al-alloy die castings. (T8, Al)

34T. Improved Method of Fabrication. *Die Castings*, v. 8, Jan. 1950, p. 36-37, 62.

New dishwasher, completely powered by water from the kitchen faucet, makes use of the lightness, corrosion resistance, and economy of Al die castings for eight major components. (T10, Al)

35T. The Basis for Selecting Alloy Cast Irons for the Petroleum Industry. Frederick G. Seifing. *Petroleum Refiner*, v. 29, Jan. 1950, p. 97-101; discussion, p. 101.

Properties available with alloy cast irons and special-service types such as Ni-Resist and Ni-Hard. (T29, CI)

36T. The Saguenay Is Bridged With Aluminum. *Engineering News-Record*, v. 144, Jan. 12, 1950, p. 32-35.

Details of design and erection procedures. (T26, Al)

37T. Steel Dam in Good Shape After 50 Years. George W. Lamb. *Engineering News-Record*, v. 144, Jan. 12, 1950, p. 36-37.

Located in Arizona. Soft open-hearth steel was used throughout except for rivets exposed to water, which are wrought iron. The structure has been painted at an average interval of 8 years. There is no sign of serious corrosion. (T4, ST)

38T. Factors in Gas Turbine Blade Production. *Aviation Week*, v. 52, Jan. 16, 1950, p. 27-28, 33-34. Based on "Blade Design and Production", by A. T. Colwell and R. E. Cummings.

Various methods include forging; lost-wax casting; machining; fabricating from sheet stock by forming and welding; sintering; rolling; and the "Mer-cast" process (use of frozen-mercury patterns instead of wax or plastic). (T25)

39T. Selection of Steel for Automobile Parts. What Engineers Should Know Today About Hardenability—Band Steels. Part VI. Where Standard H-Bands Do Not Apply. A. L. Boegehold. *SAE Journal*, v. 58, Jan. 1950, p. 47-51.

Special cases in which standard H-bands are not applicable. (T21, AY)

40T. Furnace Design and Practice. R. J. Sarjant. *Engineer*, v. 188, Dec. 23, 1949, p. 744-746; Dec. 30, 1949, p. 776-777.

Some modern features of practice in furnace heating, and certain fundamental aspects of design. First installment: Calculation of heat transmission in relation to furnace design. Final installment: Mechanization and instrumentation. (T5)

41T. Rapid-Heating Furnaces With Low Heat-Holding Capacity (Baffle Furnaces). K. A. Valentinovicha. *Promyshlennaya Energetika (Industrial Power)*, v. 6, Aug. 1949, p. 5.

Furnace in which a large part of the lining is replaced by a series of baffles with air spaces between them. Such furnaces have so much lower heat-accumulating power than usual furnaces of the same rated power that they are heated more rapidly and heat losses are less. Design and operating characteristics. (T5)

42T. Reduction of Electric-Power Consumption of Electrical Resistance Furnaces by Increasing Their Efficiency. (In Russian.) K. A. Kostanya and I. M. Lur'e. *Promyshlennaya Energetika (Industrial Power)*, v. 6, Aug. 1949, p. 10-11.

Possibility of saving power by shortening the heating coils. Production data indicate 50% increase of productivity with 25% reduction of power consumption. The method is applicable only if the furnace operates at temperatures not exceeding 800-850° C. (T5)

43T. (Book) Edes Treasure Book. 159 pages. 1949. Edes Manufacturing Co., Plymouth, Mass.

Brief articles by various authors outline procedures in photography, stripping, printing, zinc and copper etching, machining, finishing, proofing, etc. Includes a list of Edes photoengraving metals and a standard size and weight chart for metal sheets. (T9)

V

MATERIALS

Not Classified In Other Sections

1V. Magnesium—the Key to the Future. *Light Metals*, v. 12, Dec. 1949, p. 674-675. Based on "High Strength Magnesium Casting Alloy ZK61", by J. W. Meier.

Development of Mg-Zn-Cr casting alloys by Canadian Bureau of Mines. Comparative mechanical properties, compositions, and heat treatments of various German, British, American, and Canadian alloys of this type. (Mg)

2V. Molybdenum; Production, Properties and Applications. G. L. Miller. *Metal Industry*, v. 75, Nov. 18, 1949, p. 439-441.

Concluding installment: Mechanical properties, machinability, workability, weldability, and applications. Reactions with common gases and inorganic chemicals. (Mo)

3V. Cast Iron. Part II. Alloy Cast-Irons. Arthur J. Caddick. *Mining Magazine*, v. 81, Dec. 1949, p. 342-350.

Recent progress with respect to compositions having improved physical properties, corrosion resistance, heat resistance, and special suitability for specific uses or industries. (CI)

4V. New Uses Sought for Gallium. *Chemical and Engineering News*, v. 28, Jan. 2, 1950, p. 40-41.

Properties and a few applications. (Ga)

5V. The Status of Carbides Today. W. G. Robbins. *Tool & Die Journal*, v. 15, Jan. 1950, p. 52-53, 102.

Applications and present status in comparison to other cutting and forming materials. (SG-j)

6V. Steel Products Manual. Sec. 18. Steel Tubular Products. *American Iron and Steel Institute*. Nov. 1949. 239 pages.

Metallurgical aspects, manufacturing practices, and handling methods. Pipe pressure tubes, mechanical tubing, and aircraft tubing. Chemical requirements, standard practice tables, and threading data. (ST)

7V. What Is Acicular Cast Iron? W. B. Braidwood. *Foundry Trade Journal*, v. 87, Dec. 1, 1949, p. 649-653; Dec. 8, 1949, p. 685-689; Dec. 15, 1949, p. 717-719; discussion, p. 719-722.

Theory and practice in acicular-iron production. Photomicrographs show typical microstructures and effects of transformation. Final installment: Heat treatment, testing, mechanical properties, and applications. 20 ref. (CI)

8V. Spheroidal Graphite Cast Iron. W. B. Braidwood and A. D. Busby. *Machinery* (London), v. 75, Dec. 22, 1949, p. 896-902.

Previously abstracted from *Foundry Trade Journal*. See item 14B-106, 1949. (CI)

9V. Development and Status of Malleable Iron. (In German.) Franz Roll. *Neue Giesserei*, v. 36 (new ser., v. 2), Nov. 1949, p. 339-347.

Production, heat treatment, and properties of white and black-heart malleable iron. (CI)

10V. Optimum Design of Steel Castings. (In German.) Georg Schmidt. *Neue Giesserei*, v. 36 (new ser., v. 2), Dec. 1949, p. 372-378.

Principles illustrated by diagrams and illustrations. (CI)

11V. Development and Properties of a High-Test Malleable Aluminum Alloy. (In German.) H. J. Seemann. *Metall*, v. 3, Nov. 1949, p. 374-375.

Extensive tests were made to investigate the malleability, mechanical strength, and resistance to stress corrosion of an Al alloy containing 9% Zn, 1.5% Mg, 2.5% Cu, and 0.5% Mn. This alloy compared favorably with duralumin, except in its resistance to stress corrosion when annealed at 100° C. (Al)

12V. Survey of the Demands on Heat Resistant Metals and Today's Possible Solutions. (In German.) F. Rapatz. *Archiv für Metallkunde*, v. 3, Nov. 1949, p. 387-393.

Survey of literature summarizes properties of ferrous and nonferrous alloys at elevated temperatures. 10 ref. (SG-h)

13V. Engineering Applications of Ductile Cast Iron. Albert P. Gagnebin, Keith D. Millis, and Norman B. Pilling. *Machine Design*, v. 22, Jan. 1950, p. 108-114.

Latest data on the material and numerous successful applications. Mechanical properties and machinability. (CI)

14V. Austenitic and Special Stainless Steels. Samuel J. Rosenberg. *Product Engineering*, v. 21, Jan. 1950, p. 113-117.

(Second of two articles.) Basic review of the corrosion resistant or stainless steels. Properties, heat treatments, and fabricating characteristics of the austenitic and special steels. (SS)

15V. Properties of Zirconium. Francis W. Boulger. *U. S. Atomic Energy*

Commission, AECU-9798, Mar. 12, 1949, 83 pages.

Thermal, electrical, optical, thermionic, magnetic, mechanical, atomic and nuclear properties. Production, structure, corrosion, working, and special testing of Zr and Zr alloys. 97 ref. (Zr)

16V. (Book) Titanium in Steel. George Frederick Comstock, Stephen F. Urban, and Morris Cohen. 330 pages. 1949. Pittman Publishing Corp., 2 West 45th St., New York 19, N. Y.

Correlation and critical summary of available data on the use of Ti as a deoxidizer, as a carbon and nitrogen-stabilizing element, and as an alloying metal in steel. 374 ref. (Ti, ST)

17V. (Book) Steel and Steel Products. 674 pages. British Standards Institution, 24-28 Victoria St., London S.W.1, England. (Handbook No. 10.) 25s.

Divided into three sections. First section contains illustrated articles on about 20 different phases of steel manufacture. The second covers summaries of the essential technical requirements for steel and steel products. The final section covers methods of testing, heat treatment, definitions, conversion factors, and the like. (ST)

FOR SALE

Immediately available 2 practically new car bottom stress relieving furnaces, all fired and of recirculating type, completely equipped with motor operated doors and program instrumentation.

One furnace 12' wide x 22' long with capacity of 15 tons at 1200° F; the other furnace 11'9" wide x 40' long with capacity of 30 tons at 1200° F. Complete installation available for inspection. Apply Box. No. 100, Metals Review.

HERE'S HOW . . .

To get copies of articles annotated in the
A.S.M. Review of Current Metal Literature

Two alternative methods are:

1. Write to the original source of the article asking for tear sheets, a reprint or a copy of the issue in which it appeared. A list of addresses of the periodicals annotated is available on request.

2. Order photostatic copies from the New York Public Library, New York City, or from the Engineering Societies Library, 29 West 39th St., New York 18, N. Y. A nominal charge is made, varying with the length of the article and page size of the periodical.

Write to Metals Review for free copy of
the address list

METALS REVIEW

7301 Euclid Ave.

Cleveland 3, Ohio

(43) FEBRUARY, 1950

Set your Sales Sights Now . . .

for thousands of

"KEY" CONTACTS

when the

METAL INDUSTRY

meets at the

METAL SHOW

in

CHICAGO!



The week of

October 23-27, 1950



FLOOR
PLANS
NOW
AVAILABLE

NATIONAL METAL CONGRESS and EXPOSITION

INTERNATIONAL AMPHITHEATRE • CHICAGO

Sponsored by

AMERICAN SOCIETY FOR METALS • AMERICAN WELDING SOCIETY
A.I.M.E., METALS BRANCH • SOCIETY FOR NON-DESTRUCTIVE TESTING

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is

restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

FURNACE DESIGNER: Permanent position on layout, checking and assisting chief draftsman. Must be familiar with conveyers and work-handling equipment. Give full details of training and experience in first letter. Ajax Electric Co., Frankford Ave. at Delaware Ave., Philadelphia 23.

RECENT METALLURGICAL GRADUATE: For opening in the research laboratory of a large manufacturer of alloy, tool and stainless steels. In reply, please provide details concerning qualifications, experience (if any), references and salary expected. Box 2-5.

SALES REPRESENTATIVES: For manufacturer of new type controlled atmosphere heat treating furnace. Representatives should have knowledge of heat treating industry. No objection to other noncompeting lines. Territories open include New England, New York State, Pennsylvania, St. Louis and Texas. Write particulars on experience, present activities, etc. Box 2-10.

RESEARCH FELLOWSHIP: In metallurgy at Eastern University. Postgraduate work for M.S. or Ph.D. degree. Stipend \$1500 per academic year, plus tuition. Start September 1950. Applications accepted until April 1, 1950. Selection of research problem in variety of fields including welding, induction heating, corrosion, powder metallurgy, and electrometallurgy. Box 2-170.

Midwest

RESEARCH METALLURGISTS: Excellent openings for young metallurgical engineers with research experience. Advanced college training preferred but not essential. Should be able to initiate and execute over-all research program. Metals Department, Armour Research Foundation, Chicago 16.

SALESMAN: Alloy and stainless steel. Old, established steel concern with branch plants in principal cities has opening in Chicago area for graduate metallurgist with mill or industrial plant experience or equivalent. Excellent opportunity for young man now working in plant but interested in sales. Previous sales experience not necessary. State age, education, experience, salary expected. Box 2-15.

METALLURGIST: Thoroughly versed in inspection and fabrication of stainless steel. Must be capable of suggesting improvements in tools and cooperating with other departments. State education, experience, salary expected and any pertinent personal data. Box 2-20.

METALLURGIST: For laboratory and investigational work in tool and stainless mill. Three to five years' experience required. Give details of education, experience and marital status; also include photograph. Box 2-25.

METALLURGIST: For research on high temperature alloys. Experience in testing, corrosion and physical properties. Reply should indicate training, experience, past employment and salary requirements. Box 2-30.

SALES MANAGER: Hard-hitting, hard-working result getter wanted. Experience in industrial sales to metalworking plants essential. Technical training desirable. Location Chicago. Substantial salary plus commission. Box 2-35.

METALLURGISTS: Senior men needed to conduct fundamental studies in various fields of metallurgy, including process, mechanical, high temperature, corrosion, fabrication, and welding. Must have five years of professional experience or an equivalent combination of training and experience. Please forward resume of education, experience, salary and pertinent personal data. Box 2-40.

MANUFACTURER'S REPRESENTATIVE: To handle foundry line in Cleveland and surrounding areas for leading manufacturer of industrial castings. Box 2-175.

SEE ALSO BOX 2-10 ABOVE

South

METALLURGIST: Southern steel producer invites correspondence from steel metallurgist with experience covering electric furnaces, rolling mill practice and inspection procedure. Box 2-45.

SEE ALSO BOX 2-10 ABOVE

POSITIONS WANTED

METALLURGICAL ENGINEER: Graduating from large midwest university in Feb. 1950 with B.S. degree. Age 25, married, veteran. Interested in production development. Some powder metallurgy training. Midwest location preferred. Box 2-50.

SALES ENGINEER: B.S. Met. Eng. '43. Experience includes 1 1/2 years in heavy forge industry, 2 1/2 years in automotive industry, and 1 year in industrial research. Age 29, married, sociable. Registered Professional Engineer. Box 2-55.

B.S. CHEMISTRY-METALLURGY: Age 31; 2 1/2 years' experience in corrosion, heat treatment, metallography, mechanical testing; 1 year as instructor of physical metallurgy. Desires brief employment in successive phases of steel industry—from blast furnace to finished product. Anxious to learn; willing to work. Would consider permanent employment. Box 2-60.

METALLURGICAL ENGINEER: Member of graduating class at McGill University. Pertinent information sent upon request. Not available until June. Box 2-65.

METALLURGICAL ENGINEER: B.S. Carnegie Tech. Age 27, married, two children. Six years' experience—one at Mellon Institute, five with steel casting company, including 2 1/2 years as plant metallurgist, 2 1/2 years in customer service and specialty testing. Desires position in production or sales with opportunity for advancement. Cleveland or Pittsburgh areas preferred. Box 2-70.

METALLURGICAL ENGINEER: B. Met. Eng., Rensselaer Polytechnic Institute. Desires position in any phase of welding or metallurgical sales. Some sales experience. Veteran, single, age 26. Location not a limiting factor. Box 2-75.

METALLURGIST: Ten years' experience in metallurgical research and process control, ferrous and nonferrous. Also production management, sales contact and teaching experience. Excellent knowledge testing methods, quality control, report writing. Age 35, married, B.S. degree. Desires position as sales contact or process metallurgist, preferably in San Francisco or Los Angeles areas. Box 2-80.

METALLURGIST: 28 years old, married, B.S. Met. Eng. Five years' experience forge shop, gray iron foundry, steel mill, industrial plant, on development, quality control, failure investigation, report and specification writing, materials selection, heat treatment, customer contact. Especially desires position in iron foundry or in metallurgical capacity (responsible) with progressive company. Box 2-85.

METALLURGICAL ENGINEER: B.S. Carnegie Tech., 1948. Completed foundry graduate training program; summer experience in open-hearth, blast furnace and structural mill. Experience in quality control and supervision on cupolas. Age 29, family. Interested in production work or quality control. Box 2-90.

METALLURGIST: Completely experienced in toolsteels, their heat treatment and use; also stainless steels, tungsten carbides, and other engineering materials. Desires position in sales engineering or process and development work. Cleveland or northern Ohio. Married, age 35, two children. Box 2-95.

SALES ENGINEER: B.S. in Met. Eng., age 26, single. Diversified experience in ferrous metallurgy. At present, sales engineer for well-known precision forging concern. Excellent knowledge of high-temperature alloys and turbojet aircraft industry. Familiar with government work. Interested in purchasing, sales, or administrative work in the Philadelphia-Camden area. Box 2-100.

CHIEF METALLURGIST: 14 years' exceptional experience in ferrous and nonferrous metallurgy, including all phases of foundry practice, melting, alloying, heat treatment, testing, quality control of iron, aluminum, magnesium, and copper alloys. Has installed and supervised complete metallurgical control laboratories, done trouble shooting and consulting work. Employed in responsible administrative position but desires change. Age 38. Box 2-105.

TOOL AND DIE HEAT TREATER: 25 years' experience; 14 years as heat treat foreman in large company. Best of references as to ability and character. Box 2-110.

METALLURGICAL ENGINEER: B.S. in Met. Eng. 5 1/2 years' experience in welding and foundry development work. Thorough knowledge of all welding processes, foundry practice, and physical metallurgy. Well versed in metallography, physical testing, and heat treatment. Veteran, married, one child. Desires position in progressive company with opportunity for advancement. Location immaterial. Box 2-115.

METALLURGIST: Broad practical experience in melting, processing, fabrication and technical development of stainless and alloy steels. Organizational administrative ability. Systematic, cooperative and tactful worker. 22 years' association with leading steel producers and excellent references. Desires position as plant metallurgist, management assistant with special responsibility for high efficiency, quality control and customer satisfaction. Box 2-120.

POWDER METALLURGIST: Six years' research and development experience in ferrous and nonferrous powder metallurgy. Able to initiate and execute research and development projects. Box 2-125.

HEAT TREAT AND DIE ROOM FOREMAN: Excellent knowledge of all types of steel and their heat treatment. 18 years' experience; twelve as heat treat foreman; 7 as die room foreman. Capable man on extrusion and drawing dies and allied tools used in the brass manufacturing industry. Complete resume furnished on request. Box 2-130.

TOP-NOTCH METALLURGIST: Looking for the spot—not any old job. Eight years' of first-line experience in powder metallurgy, research and welding research. Thorough knowledge of ferrous and nonferrous metallurgy, proven research and supervisory ability. Publications and patents. Desires to direct laboratory or research project. Location immaterial. Box 2-135.

METALLURGICAL ENGINEER: Recent Ph.D. from large midwest university desires (1) university teaching, (2) research, or (3) production—preference in the order given. Excellent background in metallurgy, theoretical and applied mechanics, and mathematics. Married, age 32. Excellent references. All correspondence promptly answered. Box 2-140.

METALLURGIST AND MATERIALS ENGINEER: Desires supervisory position relating to production heat treating, materials control, development of improved plant methods, or field and plant trouble shooting. Experienced metallographer, heat treater, mill contact, stress analyst, metals buyer, and welding instructor (avocation). Farm equipment, automotive, ordnance and anti-friction bearing background. Age 40. Box 2-145.

SALES MANAGER: For medium sized firm, or assistant in larger firm. 20 years' experience includes drop forgings, springs, stampings, screw machine products, tool and stainless steels, jewelry and precious metal products. Box 2-150.

SALES ENGINEER: Age 30, B.S.Ch.E., married, one child. Effective sales personality with nine years' experience in sales and production. Will relocate. Box 2-155.

QUALITY CONTROL ENGINEER: Graduate metallurgist, age 30, married. Broad background in analysis of steel plant problems, including advanced training and several years' experience in applying statistical quality control methods. Capable of forming new quality control group or assuming responsible position in existing group. Box 2-160.

METALLURGICAL ENGINEER: M.S. Met. Eng., education equivalent to Ph.D. Age 29, married. Three years in nonferrous fabrication as plant metallurgist, sales and development engineer. Three years assistant professor physical metallurgy. Desires teaching, research, sales or development. Interested in technical writing. AEC security clearance. Midwest or west preferred. Box 2-165.

(45) FEBRUARY, 1950

Mountains Moved To Extract Copper, "Everlasting" Metal

Reported by H. L. Sittler
Metallurgist, Arcrods Corp.

How mountains are literally moved to extract copper from the earth was explained by R. Carson Dalzell, chief technical advisor, Revere Copper and Brass, Inc., who reviewed the metallurgy of copper and some of its alloys for the Baltimore Chapter A. S. M. on Dec. 19.

Where there once was a mountain containing a little copper (often less than 1%), man leaves a hole, and where there was a hole, he puts a mountain—without the copper. Of course, the other elements that can be extracted at the same time may well be more attractive financially than the copper itself, Dr. Dalzell pointed out.

Historically, copper is one of the oldest of metals and its alchemical symbol meant "everlasting". Copper water pipes found in the ruins of Egyptian architecture would still be usable even though they are now about 5500 years old. There are those who bemoan the "lost art" of hardening copper. It is, however, not a lost art at all and modern metallurgists can harden copper better than the ancients ever dreamed of.

The concentration, smelting and refining of copper follows the familiar pattern of flotation, sintering or roasting, smelting in the copper blast furnace or in reverberatory furnace and converter, and then perhaps electrolytic refining.

The United States occupies an unusual position in the copper market of the world, being the largest consumer—60% of world production—and one of the lesser producers—only 30% of the total. No figures of production or consumption by the U.S.S.R. are available.

Various elements, such as silver, selenium, tellurium, zinc, tin, nickel, silicon, manganese, oxygen, and beryllium in varying amounts, will affect the color, physical and mechanical properties, castability, microstructure, and heat treating properties of copper and its alloys. The speaker recommended the use of standard alloys since there are enough of them to cover practically all applications if full advantage is taken of the properties that can be developed.

Quarter-Century Club

The following A. S. M. members have been awarded honorary certificates commemorating 25 years' consecutive membership in the society:

Chicago Chapter—Aetna Ball & Roller Bearing Co. (J. J. Rozner, METALS REVIEW (46))

representative on sustaining membership), Russell M. Allen, Albert F. Christian, William H. Oldacre, William G. Praed, Thomas D. Radcliffe, Philip Schneck; Wyman-Gordon Co., Ingalls Shepard Division (A. P. Wheeler, representative on sustaining membership), N. A. Ziegler.

Montreal Chapter—B. W. Coghlin; C. F. Pascoe; Pilot Tool & Steel Co., Ltd. (Fred E. Rejall, representative of sustaining membership).

Northwest Chapter—Thomas P. Hughes

Ontario Chapter—W. J. Blair, Frank H. Briden, Thomas W. Hardy, Arthur G. Lambert, E. H. MacInnis, J. W. McBean, N. P. Petersen

Philadelphia Chapter—T. Holland Nelson

Washington Chapter—Fred L. Coonan, Thomas G. Digges, Harry J. Huester, M. J. R. Morris

Welding Patent Index Completed at O.S.U.

The department of welding engineering at Ohio State University has announced completion of a new Patent Classification Index in the A. F. Davis Welding Library, designed to make information on more than 12,000 U. S. patents on welding more easily available to industry and educational institutions.

Each patent in the library is classified or indexed in several different ways—by process, material, product, use, inventor's name, date of issue, on a single punch card. These cards are sorted mechanically, and in very little time the numbers of patents pertaining to a given field may be determined.

The use of the patent classification system is offered to industrial organizations, individuals, and educational institutions. Services are free of charge to those who make use of the index system in person, but modest charges to defray clerical expense will be made for inquiries handled by mail. Inquiries should be addressed to Prof. Robert S. Green, acting chairman, Welding Engineering Department, Ohio State University, Columbus, Ohio.

Pitt Research Grant Renewed

University of Pittsburgh recently announced a \$20,000 grant from the Acid Open Hearth Association, Inc., to renew a research program in the metallurgical engineering department. The program deals with the refining problems in the acid openhearth method of handling liquid steel. This is the eighth consecutive year such a project has been in effect.

G. R. Fitterer, head of the metallurgical engineering department, is director of the program, with which 11 steel companies are cooperating.

Stress Analysis Aids Design

Reported by Wilbur O. Manuel
*Metallurgist
AC Spark Plug Div., G.M.C.*

Stress analysis studies prior to releasing engineering prints are valuable aids to design, William T. Bean, Jr., research consultant, emphasized in a lecture before the Saginaw Valley Chapter A.S.M. on "Stress Analysis and Its Application to Engineering Design". Previous methods of calculating stress and determining necessary material strength, he said, relied upon published data and formulas, and frequently led to errors of 10 to 300% in the load-carrying ability of an engineering design.

The aircraft industry, because of its primary requirement of minimum weight without corresponding strength reduction, has been a leader in the use of this new field of stress analysis in designing parts. Weight can be materially reduced by redesign, taking advantage of a redistribution of stresses.

As an example of this principle Mr. Bean cited ribbed castings. By contouring the corners and radii to eliminate ribs and reinforcements, termed "stress raisers", large weight reductions have been possible with an increase in the strength of the parts.

In conjunction with his lecture, Mr. Bean set up a wide assortment of pick-up and amplifying instruments for measuring temperature, pressure, displacement, strain, stress and acceleration. Each instrument was described as to its sensitivity, number of phenomena that can be read simultaneously or individually, direct or indirect reading, cost, and applicability for measuring any data which may be necessary for accurate engineering design. The members were given an opportunity at the close of Mr. Bean's talk to examine and discuss this array of instruments.

New Die-Casting Award

The Annual Doehler Award has been established by the American Die Casting Institute to recognize achievements in the field of die castings. The award will consist of a suitable plaque and a cash honorarium of at least \$500. It will be presented for outstanding contribution to the advancement of the die-casting industry as represented by technical achievement, advancements in plant operations, or other activities.

Any individual, group of individuals, technical or scientific society or committee shall be eligible for the award. Nominations will be received annually between Jan. 1 and April 30. Entries should be addressed to Award Committee, American Die Casting Institute, 366 Madison Ave., New York 17, N. Y.

NATIONAL METAL CONGRESS & EXPOSITION

Chicago International Amphitheatre • October 23 to 27, 1950

Competition for Students at the 1950

Metallographic Exhibit

THE DETAILS ▶

Undergraduates can now compete on an equal basis at the metallographic exhibit held each year at the National Metal Congress and Exposition without limitations as to subject matter or techniques. Separate panels will be erected for adequate display of their best work. Excellence will be judged by the same jury that appraises the work of professionals. Prizes will be awarded as follows:

First Prize—Bronze Medal and \$25 cash.

Honorable Mentions—Ribbon and \$10 cash.

THE RULES ▶

Entrants are restricted to undergraduate students of academic institutions. ¶ No more than two entries will be accepted from a single student. ¶ Work must be done during the 1949-1950 academic year. ¶ Entries must be mounted separately on stiff cardboard. ¶ Each mount must contain pertinent information regarding subject, etchant, magnification, and special techniques (if any). ¶ Entrant must sign mount and give name of institution, course being studied, and year of graduation. ¶ Mount must be signed by departmental head, as evidence that the above conditions are met.

Send Entries (BEFORE JUNE 1, 1950) to

METALLOGRAPHIC EXHIBIT—Student Division

7301 Euclid Avenue • Cleveland 3, Ohio

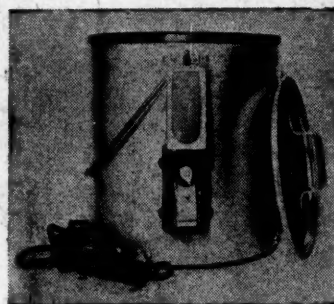
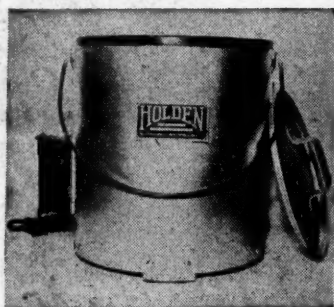
HOLDEN METALLURGICAL PRODUCTS

Salt Baths — Furnaces — Conveyors

New

SMALL ELECTRIC TEMPERING FURNACES

- FOR LABORATORY
- FOR TOOLROOM



Operating Characteristics and Sizes:

10" Diameter x 9" Deep — 110 or 220 V. — 300°–650° F. — \$141.00

12" Diameter x 10 1/4" Deep — 220 V. — 300°–650° F. — \$172.00

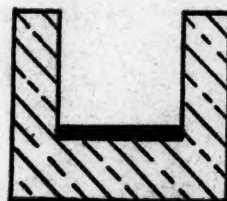
Prices Quoted Are F.O.B. New Haven, Conn.



Holden LLB Alloy



LLB Alloy
in Alloy Pot



LLB Alloy
in Ceramic Pot

HOLDEN LLB ALLOY IN AN ALLOY POT OFFERS THESE ADVANTAGES:

1. Prevents burn-out at the bottom of the pot.
2. 10% increase in efficiency and production when used with neutral baths.
3. 10% decrease in fuel consumption when used in a carburizing bath . . . longer pot life
4. When used in a ceramic pot all sludge can be removed at just above the melting point of the salt; therefore, little, if any, rectification is required and there is no decarburization on tools or production parts.

THE A. F. HOLDEN COMPANY

Metallurgical Engineers

MANUFACTURERS OF HEAT TREATING BATHS & FURNACES

NEW HAVEN, B. Conn.

1431 W. Fort Street, Detroit 16, Mich.

FOREIGN MANUFACTURERS: Canada—Peacock Brothers, Ltd., Montreal; France—Fournier, Electrochimie, R. Roche, Paris;
Belgium—Le Four Industriel Belge, Antwerp.

REPRESENTATIVES IN TWENTY-ONE FOREIGN COUNTRIES

